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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1904.

mpliments of

Public Water Board,

WM. B. LITTLEFIELD, *Prest.*

LYNN, MASS.
FRANK S. WHITTEN, PRINTER
1905

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PUBLIC WATER BOARD FOR 1905.

W. B. Littlefield, *Pres.*, for five years.

S. W. Dearborn, for one year.

James Burns, for two years.

C. E. Sprague, for three years.

Thomas P. Nichols, for four years.

OFFICERS FOR 1904.

William B. Littlefield, *Pres.*,
For one year.

S. W. Dearborn,
For two years.

James Burns,
For three years.

C. E. Sprague,
For four years.

Thomas P. Nichols,
For five years.

Superintendent and Clerk, D. A. Sutherland.
Water Registrar, Wallace O. Mudge.
Pumping Engineer, C. A. Cowles.
Assistant Engineer, George H. Venn.
Foreman of Mains, Edwin Maxwell.
Forman of Services, Henry Wheelock.
Foreman of Meters and Repairs, W. H. McClain.

INSPECTORS.

Winslow J. Rowell,
W. B. Moulton,
J. Frank Pool.
John Chamberlain.

CLERKS.

Mabel R. Butler,
Helene C. Pinkham.

ANNUAL REPORT.

To the Honorable Mayor and City Council.

GENTLEMEN,—The Public Water Board, in conformity with the charter and ordinances, have the honor to present this thirty-third annual report, together with the reports of the Superintendent and Registrar.

Water Supply.

The area from which the city has a right to take water comprises the water-shed of the Saugus River, above the dam at Montrose, exclusive of the water-shed of Lake Quannapowitt, the water-sheds of Breed's Pond, Birch Pond, Hawkes Pond and Glen Lewis and Walden Ponds. The Saugus River water-shed is connected with Hawkes Pond by a conduit capable of delivering about 30,000,000 gallons of water per day. These sources are all connected with each other and with the pumping station.

From these sources there can be collected, in years of average rainfall, some 3,500,000,000 gallons of water. Two-thirds of this must be collected between the first of January and the first of June, and more than one-half between the first of February and the first of May.

The months of maximum flow from the water-sheds do not correspond with the months of maximum consumption of water, in fact, the reverse is the case. Thus, July is the month of maximum consumption and of minimum flow. For this reason it is necessary to store the surplus water of the flood season for use during the season of small flow.

Our sources of supply have always been ample to provide plenty of water for many years in advance of our needs, but the capacity of our works for the storage of the water from these sources has heretofore been barely sufficient to prevent a shortage of water each year.

Birch Pond dam was raised in 1884 to provide additional storage. Walden and Glen Lewis Ponds were built in 1889, and Hawkes Pond in 1895 for the same purpose. The rapid growth of the city, however, rendered it necessary each time that provision should be made for the storing of continually larger and larger volumes of water.

Up to the present time the storage system has been made up of the following reservoirs:

Ponds.	Acres.	Capacity in Gallons.
Breed's	54.85	262,563,340
Birch	82.00	381,062,901
Glen Lewis	36.00	120,475,126
Hawkes	75.00	300,000,000
Walden	128.00	403,163,626
A total storage of		1,467,265,193

The coming year will mark the completion of the largest work ever undertaken by the city to provide for the storage of water. The work of raising the dam at Walden Pond, 20 feet, was begun in 1902 and when completed will add 1,230,518,078 gallons to the amount of water that can be stored, making the total storage capacity of the system 2,697,783,271 gallons. This is 745,764,705 gallons in excess of our present consumption and places our system in better condition to assure an abundant supply of water at all times that it has ever been. The weakest point in our system has always been the lack of adaquate storage, but the completion of Walden Pond dam will bring the storage capacity of the system into proper relation to our sources of supply.

It may have seemed at times that the Board was unnecessarily persistent in urging the various steps towards the storage of more water; but there have been many times during the last ten years, when the departments of other cities were considering the probable failure of their water supply, the Board has been aware that the same conditions confronted our city. The Board, however, believing that the interests of the city were not to be served by publishing statements that the city was nearly out of water, has devoted its energies to making the most of the resources at hand and to urging further extensions of the storage system. With the completion of the dam at Walden Pond the Board will experience a feeling of security to which it has been a stranger during the last ten years.

In its report to the City Council for the year 1900, the Board estimated the cost of the proposed work on Walden Pond at $359,015 and the work will be finished for an amount less than three per cent. in excess of that estimate.

Financial.

At the present time much is being written about Municipal Ownership of Public Utilities, and the opponents of the idea contend that it is impossible to carry on the affairs of a municipal department on a business basis, or in a way that would reflect credit upon the management if the department were a private business enterprise. It has been contended that public management was excessively costly and wasteful in comparison with private management. The Board does not propose to discuss the question of Municipal Ownership, but it seems proper in view of the public interest in the question, to state a few facts regarding the results of public administration of the affairs of the Lynn Water Department, during the last fifteen years, from a business standpoint.

It will be seen from a consideration of these facts, that, had the Lynn Water Department been a private enterprise the shareholders would have had no cause for complaint against the management.

On the first of January, 1890, the total value of the Lynn Water Works plant, figured at what it had actually cost, was $1,659,282.54. On January first, 1905, the value of the water works was $2,900,890.89, an increase of $1,241,608.35, or 74.8 per cent. On the first of January, 1890, the net water debt was $1,256,642.42, while on the first of January, 1905, it was $1,413,414.22, an increase of only $156,771.80, or 12.5 per cent, so that while the value of the plant increased $1,241,608.35, or 74.8 per cent. in fifteen years, the net debt increased only $156,771.80, or 12.5 per cent. in the same time.

During these fifteen years the department has earned, each year, the entire cost of maintenance, renewals, and repairs, and besides has averaged to earn every year 6.4 per cent. on the total cost of the works. These earnings do not include the value of the water used by the city for public buildings, street sprinkling, sewer, flushing, fire and all other city purposes. If the value of the water used by the city is credited to the earnings of the department, as it would be in the accounts of a private enterprise, the Water Department has averaged to earn, each year for the last fifteen years, 7.3 per cent. on the total cost of the works, besides earning the entire cost of maintenance.

This has been brought about, not because of high water rates for the rates are as low as in any city or town in the state and lower than in most cities and towns. It has been made possible by the fortunate situation of Lynn in regard to sources of supply and by reason of the application of business principles to the conduct of the affairs of the department, from the time our system was first established.

Statement.

WATER DEBT.

Amount of debt, December 19, 1903	$2,167,300 00	
Bonds matured and paid in 1904	7,300 00	
Amount of debt, December 19, 1904		$2,160,000 00

SINKING FUNDS.

Amount of funds, December, 1903	$655,306 72	
Received from City Treasurer in 1904	41,127 45	
Earnings of sinking funds in 1904	26,451 61	$722,885 78
Deduct bonds paid within year		7,300 00
		$715,585 78
Amount in hands of Treasurer, December 19, 1904		31,000 00
		$746,585 78
Net total debt		$1,413,414 22

Water Maintenance.

Treasurer's Statement for the year ending December 19, 1904.

RECEIPTS.

From water rates		$225,119 49

EXPENDITURES.

For maintenance	$108,327 61	
For interest	85,791 88	
		194,119 49
Net income for year ending December 19, 1904		$31,000 00

THE PUBLIC WATER BOARD,

WILLIAM B. LITTLEFIED, *Pres.*

REPORT OF WATER REGISTRAR.

OFFICE OF THE PUBLIC WATER BOARD,
LYNN, MASS., January 1, 1905.

To William B. Littlefield, President:

SIR,— I herewith present the financial condition of the department for the year ending December 31, 1904.

RECEIPTS FOR 1904.

Fixture rates	$110,890 67	
Meter rates	103,824 10	
Miscellaneous	8,564 51	
Additional rates	1,162 86	
Fines	57 30	
Total revenue		$224,499 44
Extra pipe		2,566 43
Total receipts as per cash book		$227,065 87

COMPARATIVE STATEMENT OF REVENUE.

Amount collected during the year		$227,065 87
Amount outstanding, fixture rates	$22,017 98	
Amount outstanding, meter rates	9,402 30	
Amount outstanding (not due) meter rates	23,428 47	
		54,848 75
		$281,914 62
Deduct amount due January 1, 1904		48,207 79
Revenue for 1904		$233,706 83
Revenue for 1903		224,440 44
Increase		$9,266 39

STATEMENT OF NET EARNINGS FOR [illegible].

Revenue		[illegible]

EXPENSES.

Maintenance	$101,040 00	
Interest	[illegible]	
Rebate to Saugus	[illegible]	
		[illegible]
		[illegible]

MAINTENANCE.

Mains	$31,037 04	
Engines and boilers, Walnut street	18,433 07	
Pumping expenses, Walnut street	15,890 43	
Salaries and expenses	9,805 10	
Services	6,058 30	
Meters	6,573 80	
Glen Lewis Pond	4,287 07	
Stable and shop	3,544 24	
Pumping expenses, new station	1,580 02	
Walden Pond	1,212 04	
Taxes, Saugus	994 74	
Canal	604 25	
Damages	579 50	
Engine house, Walnut street	343 83	
		$101,040 00

CONSTRUCTION.

Walden Pond dam	$81,070 73	
Services	9,048 62	
Gate chamber, Walden Pond	2,053 03	
Mains	595 40	
		$92,770 78
Less amount received for pipe		2,560 43
Net		$90,210 35

STATEMENT.

SHOWING COST OF WORKS TO JANUARY 1, 1905.

Mains, hydrants and gates	$883,301 62
Walden and Glen Lewis Ponds	496,310 61
New supply and land	338,595 27
Services and courts	333,390 36
Engines and boilers	140,327 29
Hawkes Pond	161,036 53
Reservoirs and land	131,581 49
Birch Pond and land	93,471 84
Engine house, pump and conduit, Walden Pond,	83,003 72
Engine house and land	57,562 39
Breed's Pond and land	57,135 28
Pipe conduits and land	81,289 39
Hawkes Pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
Highland service	12,431 17
Engineering	11,157 95
Tubular wells	9,470 02
Workshop and stable	2,056 97
Compressor	515 00
	$3,053,935 85
Less amount received for pipe	153,044 96
Total net cost	$2,900,890 89

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Number of services in Lynn	12,164	
Number of services in Saugus	1,083	
Total		13,247
Number put in during the year (Lynn)	210	
Number put in during the year (Saugus)	50	
Total		260
Number extended during the year (Lynn)	28	
Number extended during the year (Saugus)	2	
Total		30
Renewed	76	
Number discontinued	21	
Number not in use	24	
Turned on (new services)	85	
Turned on (reoccupied)	141	
Turned on (repairs)	43	
Shut off (for vacancy)	118	
Shut off (for non-payment)	25	
Shut off (for repairs)	51	

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1904.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	12,187	1,020	13,207
Stores and shops	1,241	48	1,289
Factories	209	4	213
Offices	510	17	527
Restaurants and saloons	80	..	80
School-houses	60	7	67
Churches	32	5	37
Bakeries	30	..	30
Laundries	20	..	20
Engine houses	12	3	15
Families	17,070	1,117	18,187
Boarding-houses	225	2	227
Faucets	31,851	1,939	33,790
Water-closets	14,715	495	15,210
Bath tubs	5,449	362	5,811
Hose bibs	3,240	174	3,414
Urinals	192	8	200
Heaters	337	70	407
Stationary engines	167	7	174
Motors	25	..	25
Greenhouses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	20	1	21
Stand-pipes for water-carts	79	..	79
Sewer connections	25	..	25
Automatic sprinklers	109	5	114
Hydrants	806	160	966
Hydrants for car sprinklers	44	1	45

STATEMENT.

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,098 15
From January 1, 1873, to January 1, 1874	47,002 01
From January 1, 1874, to January 1, 1875	53,545 01
From January 1, 1875, to January 1, 1876	52,553 36
From January 1, 1876, to January 1, 1877	60,897 13
From January 1, 1877, to January 1, 1878	64,002 00
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,010 80
From January 1, 1880, to January 1, 1881	70,635 13
From January 1, 1881, to January 1, 1882	80,067 76
From January 1, 1882, to January 1, 1883	94,410 52
From January 1, 1883, to January 1, 1884	98,843 54
From January 1, 1884, to January 1, 1885	114,013 86
From January 1, 1885, to January 1, 1886	110,080 11
From January 1, 1886, to January 1, 1887	116,573 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,180 77
From January 1, 1889, to January 1, 1890	141,805 53
From January 1, 1890, to January 1, 1891	154,788 27
From January 1, 1891, to January 1, 1892	171,744 85
From January 1, 1892, to January 1, 1893	188,970 88
From January 1, 1893, to January 1, 1894	177,803 56
From January 1, 1894, to January 1, 1895	176,055 50
From January 1, 1895, to January 1, 1896	185,572 88
From January 1, 1896, to January 1, 1897	190,531 33
From January 1, 1897, to January 1, 1898	183,711 07
From January 1, 1898, to January 1, 1899	186,658 35
From January 1, 1899, to January 1, 1900	193,690 01
From January 1, 1900, to January 1, 1901	190,003 54
From January 1, 1901, to January 1, 1902	203,078 45
From January 1, 1902, to January 1, 1903	215,692 03
From January 1, 1903, to January 1, 1904	224,440 44
From January 1, 1904, to January 1, 1905	233,706 83
	$4,438,242 23

FUNDED WATER LOAN.

When Payable.	Rate Per Cent.	Amount
January 1, 1905	5	$200,000
January 1, 1905	4	150,000
May 1, 1905	3½	66,500
December 1, 1905	3¾	5,000
November 1, 1913	4	20,000
November 1, 1914	3¾	31,000
March 15, 1915	4	50,000
December 1, 1914	4	20,000
December 1, 1915	3¾	6,000
April 1, 1916	3⅛	2,000
May 1, 1916	3½	24,500
September 1, 1916	4	10,000
October 1, 1916	4	9,000
February 1, 1917	3½	6,500
June 1, 1917	3½	3,500
July 1, 1917	4	7,500
August 1, 1917	4	5,000
October 1, 1917	4	2,000
November 1, 1917	4	6,500
April 1, 1918	4	15,000
June 1, 1918	4	10,000
July 1, 1918	4	50,000
April 1, 1919	4	100,000
July 1, 1919	4	110,000
January 1, 1920	4	35,000
April 1, 1920	4	150,000
April 1, 1921	4	50,000
October 1, 1921	4	25,000
January 1, 1922	4	50,000
July 1, 1922	4	25,000
April 1, 1923	4	40,000
July 1, 1925	4	165,000
July 1, 1926	4	50,000
September 1, 1927	4	25,000
July 1, 1928	4	25,000
October 1, 1928	4	10,000
July 1, 1929	4	25,000
January 1, 1930	4	25,000
October 1, 1930	4	25,000
Note (on demand)	4	100,000
July 1, 1931	4	25,000
January 1, 1932	3½	75,000
April 1, 1932	3½	325,000
		$2,160,000

REPORT OF SUPERINTENDENT.

To the Public Water Board:

GENTLEMEN,— In compliance with the city ordinance I herewith present the annual report of the Superintendent for the year ending December 31, 1904.

Water Supply.

The following ponds have contributed the water supply during the past year:

Ponds.	Gallons.	Gallons.
Breed's	234,286,355	
Birch	587,500,833	
Walden	488,502,437	
Lewis	233,142,000	
Hawkes	409,688,075	
Total pumpage in 1904	———	1,953,218,700
Total pumpage in 1903		1,873,992,750
Increase of pumpage the past year .		79,225,950
Total consumption of water the past year		1,952,018,566
Total consumption of water in 1903 .		1,875,197,646
Increase of consumption the past year .		76,820,920

Our total consumption of water for the year 1904 was 1,952,018,566 gallons, an increase of 76,820,920 gallons over the preceding year. The consumption of water the past year has been 484,753,373 gallons in excess of our storage capacity.

The average consumption of water per day in 1904 was 5,333,384 gallons with an average daily increase of 195,857 gallons of water more than in 1903.

On December 29, 1903, the several ponds contained 179,180,262 gallons of water equal to thirty-four days' supply, on the above date the ponds had reached their lowest depth for the year.

The lowest point reached for the year 1904 was on February 18, when the several ponds contained 89,916,513 gallons, equal to fifteen days' supply showing a decrease in the amount of water in the ponds in 1904 from the amount we had in store in 1903 of 89,263,749 gallons, showing conditions to be critically alarming, but providentially we had a rainfall on the 21st and 22nd of February which relieved us from further anxiety. Every precaution was taken in the spring of 1904 to fill all the ponds to their fullest capacity. Walden Pond was filled one foot more than in previous years, increasing the supply 44,035,575 gallons, also Glen Lewis Pond was raised one foot with an increase of 15,000,000 gallons, a total of 59,000,000 gallons, equal to eleven days' supply.

Grubbing.

The work of grubbing and graveling the bottom of the ponds will be continued to completion in 1905.

The new dam is now so near completion that it will be safe to store four feet more water in Walden Pond in 1905 than in any previous year, giving an increase of 175,993,472 gallons equal to thirty days' supply.

The Loretz pump at new pumping station was started April 13, 1904, for the purpose of filling Walden and Birch Ponds and run until May 2, pumping 413,784,250 gallons of water, nearly three months' supply. If the pumps had not been installed until after the completion of the dam the city would have been without water for more than two months, during the year 1904.

Leavitt Pump Rebuilt.

The Public Water Board considering the safety of the Leavitt pump had it examined in the early part of June by A. J. Loretz and by George H. Barrus, June 20, 1904, both expert engineers, and they were of the opinion that the pump was in bad condition owing to a crack in valve plate and the pump chamber was corroded inside and outside with rust which had eaten an appreciable amount into the surface of the metal which had also weakened the valve chamber and pump cylinder. The engine was considered to be in excellent condition and with new pumps added would do good service for several years. And the Board decided that it would be well to increase the efficiency and safety of the pumping plant at Walnut street by remodeling the pumping apparatus of the reserve engine.

Plans were submitted by Loretz & Son to furnish and connect in complete running order an entire new pumping outfit to the Leavitt engine and furthermore to be so connected with various ponds now leading to the Walnut Street Pumping Station as to receive the full benefit of the various pressures, thereby reducing the strain upon the working parts of the engine and will also enable us to run the plant at a considerable less expense. On the 29th of August, Loretz & Son commenced the remodeling of the pumping apparatus and completed the work on December 3, 1904. After the completion of the work the pumps were started up for trial, with satisfactory results, showing an increased capacity by pumping 500,000 gallons per twenty-four hours more than the old pump.

The total capacity of the Leavitt pump when new was 5,000,000 gallons but for several years it has been deemed inexpedient to pump more than four and one-half million gallons per day of twenty-four hours. The new pump with a capacity of 5,500,000 and the Loretz high service auxiliary pump with a capacity of 1,500,000 gallons would give us a pumping capacity of 7,000,000 gallons per day, and should the large Loretz pump become disabled we would be able to supply the demands of the city with the new pump.

Court Pipes Laid in 1904.

Sluice road from 216 Lynnfield street, 534 feet 2-inch galvanized iron pipe laid November 16, 1904.

Court in Edwin Bates estate from 155 Essex street, 125 feet of 1½-inch galvanized iron pipe laid November 21, 1904.

Rockmere terrace from Commercial street, 362 feet of 4-inch cast-iron pipe December 5.

Prospect-street place from 51 Prospect street, 158 feet of 1¼-inch galvanized iron pipe laid December 15.

Greenwood avenue from Cliff street, 157 feet of 2-inch galvanized iron pipe laid December 6.

Extension.

Cliff street, 754 feet of 6-inch cast-iron pipe laid December 10, 1904.

Cement-Lined Pipes Removed and Relaid with Cast-Iron.

Western avenue from Houghton square to Fairchild street, 2,342 feet of 6-inch cement-lined pipe removed and re-laid with 10-inch cast-iron pipe, finished May 28, 1904.

South street from Summer to Market square, 976 feet of 6-inch cement-lined pipe removed and re-laid with 8-inch cast-iron pipe, June 10.

Summer street from Albion street to Mill Pond bridge, 787 feet 6-inch cement-lined pipe and re-laid with 6-inch cast-iron pipe, April 23.

Maple street from Chestnut to Western avenue, 1,636 feet of 8-inch cement-lined pipe removed and re-laid with 8-inch cast-iron pipe, July 20.

Summer street from South to Western avenue, 1,432 feet of 6-inch cement lined pipe removed and re-laid with 8-inch cast-iron pipe, August 27.

Western avenue from Summer street to Federal and South 1,840 feet 8-inch cement-lined pipe removed and re-laid with 12-inch cast-iron pipe, October 31.

Western avenue from Whiting to Washington street, 1,825 feet of 10-inch cement-lined pipe removed and re-laid with 10-inch cast-iron pipe, October 25.

Western avenue from Maple to Bellair, 775 feet and 216 feet above Washington of cement-lined pipe and re-laid with 10-inch cast-iron pipe, August 13.

Cleveland street from Maple to Western avenue, 365 feet of 4-inch cement-lined pipe removed and re-laid with 4-inch cast-iron pipe, July 23.

Chatham street from Eutaw avenue to Essex, 2,160 feet of 6-inch cement-lined pipe removed and re-laid with 6-inch cast-iron pipe, July 12.

Ingalls street from Jackson to Chatham street, 907 feet of 6-inch cement-lined pipe removed and re-laid with 6-inch cast-iron pipe, June 20.

Gage street from Lake avenue to ice houses, 412 feet of 4-inch cement-lined pipe removed and re-laid with 4-inch cast-iron pipe, June 10.

Ocean street from Nahant to Atlantic, 1,002 feet of 6-inch cement-lined pipe removed and re-laid with 8-inch cast-iron pipe, July 23.

Ocean from Bassett to Lewis, 1,150 feet 6-inch cement-lined pipe removed and re-laid with 8-inch cast-iron pipe, August 5.

Ocean street from Lewis to Eastern avenue, 975 feet of 10-inch cement-lined pipe removed and re-laid with 10-inch cast-iron pipe, August 22.

Lewis street from Cherry to Ocean, 2,175 feet of 10-inch cement-lined pipe removed and re-laid with 10-inch cast-iron pipe, September 21.

Acorn street from Hollingsworth to High Rock street, 450 feet of 4-inch cement-lined pipe removed and re-laid with 6-inch cast-iron pipe, November 16.

Services.

New services in Lynn	210
New services in Saugus	50
Number feet lead lined pipe	9,957
Number feet galvanized iron pipe	
Number of services renewed	105
Number of services extended, Lynn and Saugus,	29
Number of services discontinued	18
Number of services changed from old main to new	520
New service boxes, Lynn and Saugus	275
New service boxes in place of old boxes	7
Service boxes repaired	79
Number of leaks repaired	366
Number services lowered	4

Number force service pipes bushed out		1,713
Lead connection renewed with corporations		517
Lead connection renewed without corporations		48
Number services frozen		304
New meters		359
Meters repaired		438
Meters changed		126
Meters reset		13
Meters exchanged		32
Meters frozen		51
New meter boxes		13
Meter boxes repaired		2
Houses inspected, Lynn and Saugus		17.640
Leaks reported and notices issued:		
Faucets	114	
Bath tubs	6	
Water closets	643	
Tanks	77	
Pipes burst inside premises	11	
		851
Decrease in number of leaks for 1904		123
Yearly bills delivered.	2,000	
Semi-annual bills delivered	19,500	
Quarterly bills delivered	18,000	
		39.500
Summons delivered		1,750
Number meters read		4,825

During the year 16 new gates have been set in connection with new mains and 3 gates repaired, 16 new gates in place of old ones and 16 new gates boxes have been set in connection with new mains, 44 to replace old ones, 2 fire hydrants to replace old ones, 27 fire hydrants were repaired, 2 fire hydrants moved, 96 main pipe leaks repaired, 8 car sprinklers repaired, 1 new sprinkling pipe put in, 2 drinking fountains repaired, 17 new private hydrants put in, 7 private hydrants repaired, 18 sprinkling pipes repaired.

Fire Pipes Put In During the Year.

Lynn Theatre, Summer street; Lennox Building, corner Market and Harrison avenue; Excel Shoe Form Co., 49 State street; Realty Building, Union street; Realty Building, Broad street; Saugus Manufacturing Co., Saugus; Scott's Mills, Saugus.

Fire Pipes Changed.

Walton & Logan, 685 Washington street; Realty Building, Washington street.

Respectfully submitted,

D. A. SUTHERLAND,

Superintendent.

Microscopical Examination of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1904.	January 18.	March 12.	May 11.	July 8.	September 10.	November 7.				
Number of Sample	48624	49000	49401	50007	51142	51974				
Plants.										
DIATOMACEÆ:	16	0	390	96	83	1506				
Asterionella	0	0	32	16	26	1398				
Synedra	3	0	176	0	4	18				
Tabellaria	7	0	178	22	4	34				
CYANOPHYCEÆ:	0	0	0	39	28	0				
Anabæna	0	0	0	23	20	0				
ALGÆ:	2	0	86	132	66	152				
Protococcus	0	0	22	120	48	0				
Raphidium	1	0	46	4	6	62				
Animals.										
INFUSORIA:	32	1	458	10	43	2				
Dinobryon	29	0	414	4	20	0				
Glenodinium	1	0	42	4	0	0				
Uorglena	0	0	0	0	1	0				
Vorticella	0	0	0	0	14	0				
VERMES: (Polyarthra)	0	0	0	2	0	0				
CRUSTACEA: (Cyclops)	0	0	.02	0	0	0				
MISCELLANEOUS:										
Zoöglœa	3	5	10	5	3	5				
Total	53	6	944	284	223	1665				

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1904.	January 18.	February.	March 12.	April.	May 11.	June.	July 8.	August.	September 10.	October.	November 7.	December.
Number of Sample . .	48725		49001		49402		50008		51141		51975	
Plants.												
DIATOMACEÆ:	18		9		89		3196		210		204	
Asterionella	6		1		12		1083		174		50	
Tabellaria	0		8		32		2104		22		109	
CYANOPHYCEÆ:	0		0		0		2		190		0	
Anabæna	0		0		0		0		190		0	
ALGÆ:	0		0		19		10		33		68	
Raphidium	0		0		2		4		9		52	
Animals.												
INFUSORIA:	0		1		38		390		5		1	
Dinobryon	0		0		20		232		1		0	
Glenodinium	0		0		16		158		0		0	
VERMES: (Anurea)	0		0		0		0		0		1	
CRUSTACEA: Cyclops)	.04		0		0		.04		0		0	
MISCELLANEOUS: Zoöglœa	4		5		6		5		6		5	
Total . . .	22		15		152		3603		444		279	

Microscopical Examination of Water from Glen Lewis Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1903.	January.	February.	March.	April.	May 11.	June.	July 15.	August.	September 10.	October.	November.	December.
Number of Sample . .					40403		50130		51145			
Plants.												
DIATOMACEÆ					444		24		420			
Synedra					390		20		4			
Tabellaria					52		4		400			
CYANOPHYCEÆ					2		74		4			
Anabæna					0		0		4			
Merismopedia . . .					2		55		0			
ALGÆ					140		18		92			
Raphidium					144		0		42			
Animals.												
INFUSORIA					198		27		90			
Dinobryon					192		0		24			
Glenodinium					4		3		36			
Raphidomonas . . .					2		21		0			
Trachelomonas . . .					0		0		20			
Uroglena					0		0		2			
VERMES												
Rotatorian ova . . .					2		0		0			
CRUSTACEA					0		0		0			
MISCELLANEOUS.												
Zoogloea					8		3		5			
Total					800		146		611			

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1904.	January 18.	February.	March 12.	April.	May 11.	June.	July 8.	August.	September 10.	October.	November 7.	December.
Number of Sample . .	48620		49002		49404		50009		51144		51076	
Plants.												
DIATOMACEÆ:	5		9		322		1004		12		135	
Asterionella	3		0		36		250		0		92	
Cyclotella	1		0		0		84		0		28	
Synedra	1		0		212		0		5		14	
Tabellaria	0		1		74		670		0		0	
CYANOPHYCEÆ:	0		0		0		0		4		0	
Anabæna	0		0		0		0		2		0	
ALGÆ:	0		0		10		6		33		12	
Animals.												
INFUSORIA:	69		1		296		56		2		3	
Dinobryon	63		0		294		0		0		0	
Glenodinium	6		0		2		56		0		1	
VERMES: (Anurea)	0		0		0		2		0		1	
CRUSTACEA: (Cyclops)	.02		0		0		0		0		0	
MISCELLANEOUS: Zoöglœa	6		6		5		5		3		4	
Total	80		16		633		1073		54		155	

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1904.	January.	February.	March.	April.	May 11.	June.	July 8.	August.	September 10.	October.	November.	December.
Number of Sample . .					49405		50010		51143			
Plants.												
DIATOMACEÆ:					396		10		74			
Synedra					278		0		14			
Tabellaria					88		4		28			
CYANOPHYCEÆ:												
Anabæna					0		8		4			
ALGÆ:					88		58		56			
Protococcus					10		53		30			
Animals.												
INFUSORIA:					668		18		108			
Dinobryon					664		0		96			
VERMES:					2		0		0			
CRUSTACEA: (Cyclops)					0		.02		0			
MISCELLANEOUS, Zoöglœa					6		8		8			
Total					1150		108		252			

TABLE 1.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, [illegible]

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average gallons to each inhabitant.	Average gallons to each consumer.
January	181,838,000	[illegible]	[illegible]	. . .	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	. .	[illegible]	[illegible]
April	[illegible]	[illegible]	. . .	[illegible]	[illegible]	[illegible]
May	152,078,480	[illegible]	. . .	101,115	[illegible]	[illegible]
June	157,812,347	[illegible]	[illegible]	. . .	[illegible]	[illegible]
July	170,001,718	[illegible]	[illegible]		[illegible]	[illegible]
August	173,711,005	[illegible]	[illegible]	.	[illegible]	[illegible]
September	150,046,101	[illegible]	105,951	.	[illegible]	[illegible]
October	152,110,722	[illegible]	. . .	11,111	[illegible]	[illegible]
November	141,712,003	4,820,733	11,151	. . .	[illegible]	[illegible]
December	163,631,050	5,278,421	91,510	.	[illegible]	[illegible]
Totals and averages	1,954,018,574	5,353,381	105,957	.	[illegible]	[illegible]

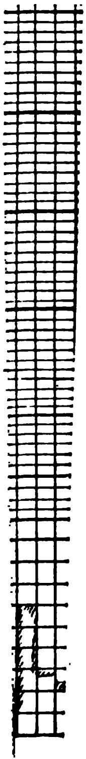
Basis: Population, Lynn and Saugus, [illegible]

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING THE YEAR 1904.

MONTH.	GALLONS.					
	Breed's.	Birch.	Walden.	Lewis.	Hawkes.	Total.
January . .	3,142,125	. . . . . .	. . . . . .	. . . . . .	177,900,625	181,042,750
February .	86,966,833	. . . . . .	67.787,417	. . . . . .	21,057,750	175.812,000
March . . .	41,526,480	. . . . . .	134,383,520	. . . . . .	. . . . . .	175,910,000
April . . .	2,811,375	96,193,125	48,007,750	. . . . . .	. . . . . .	147,012,250
May	78,291,792	71,746,208	. . . . . .	. . . . . .	. . . . . .	150,038,000
June	. . . . . .	160,695,500	. . . . . .	. . . . . .	. . . . . .	160,695,500
July	. . . . . .	105.288,750	64,116,500	. . . . . .	. . . . . .	169,405,250
August . .	. . . . . .	. . . . . .	174,207,250	. . . . . .	. . . . . .	174,207,250
September .	. . . . . .	. . . . . .	. . . . . .	160,119.750	. . . . . .	160,119,750
October . .	. . . . . .	77,934,500	. . . . . .	73,022,250	. . . . . .	150,956,750
November .	21,547,750	75.741,750	. . . . . .	. . . . . .	45,900,750	143,190,250
December .	. . . . . .	. . . . . .	. . . . . .	. . . . . .	164,828,950	164,828,950
Totals . .	234,286,355	587,599,833	488,502,437	233,142,000	409,688,075	1,953,218,700

Largest day, February 17th, 9,849,000 gallons. Largest week, week ending March 12th, 45,006,500 gallons.



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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

TABLE [illegible]

RAINFALL AT THE [illegible] STATION FOR [illegible]

Day of Month	January	February	March	April	May	June	July	August	September	October	November	December
1			[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			
2						[illegible]		[illegible]				
3			[illegible]									
4												
5							[illegible]	[illegible]	.	[illegible]		[illegible]
6	.	*0.45				[illegible]		[illegible]				
7			[illegible]	.		[illegible]						
8	*0.52	. . .		[illegible]				[illegible]	[illegible]	[illegible]		[illegible]
9	[illegible]			[illegible]	[illegible]				[illegible]			
10	. .			[illegible]	[illegible]			[illegible]		[illegible]		
11				[illegible]			.	[illegible]	[illegible]	.		
12	[illegible]			[illegible]	.	.			[illegible]	[illegible]		[illegible]
13	[illegible]					.	[illegible]	[illegible]		[illegible]	[illegible]	
14	.	[illegible]						[illegible]	[illegible]			
15	.	*1.14	[illegible]	. . .	[illegible]				[illegible]			[illegible]
16	[illegible]	.	.	[illegible]	.	.	[illegible]	[illegible]				
17		.			.		.					[illegible]
18	. .	.	[illegible]	.	[illegible]	. .					.	
19	. .	*0.18	[illegible]	[illegible]	[illegible]	.		[illegible]				
20	. .	.	.	[illegible]	.	.		[illegible]		[illegible]		
21	[illegible]	[illegible]	. .	.	.	[illegible]				[illegible]		
22	*0.34	[illegible]	0.25	. .	.	[illegible]	[illegible]	.				[illegible]
23	*0.07		. .	. .	. .	.	[illegible]					
24	. .	*0.20	. .	[illegible]	.	.	[illegible]		[illegible]		[illegible]	
25	. .	. .	. .	. .	[illegible]	[illegible]	[illegible]					[illegible]
26	*0.03	. .	. .	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]		[illegible]
27	. .	.	. .	[illegible]	[illegible]			.				[illegible]
28	0.14	[illegible]	. .	[illegible]	.	[illegible]	[illegible]				[illegible]	[illegible]
29	. .	[illegible]	. .	. .	.	[illegible]	.		[illegible]		[illegible]	
30	. .	. . .	. .	. .	[illegible]	[illegible]	. .		[illegible]			
31	. .	. . .	[illegible]	. .		.	. .					
Total	3.54	2.05	[illegible]	[illegible]	1.70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* Snow.

Total for the year 41.50.

TABLE IV.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1904.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	*.09	.94	. .	.41	. .	.43	. .	. .	. .	. .
2	. .	. .	. .	. .	. .	.18	. .	.03	. .	. .	. .	. .
3	. .	. .	.36	. .	. .	. .	. .	. .	. .	. .	. .	. .
4	. .	. .	. .	. .	. .	. .	. .	.16	. .	. .	. .	. .
5	. .	. .	. .	. .	. .	. .	.33	. .	. .	.25	. .	.14
6	. .	*.40	. .	. .	. .	.61	. .	. .	. .	. .	. .	. .
7	. .	. .	.71	. .	. .	. .	. .	. .	. .	. .	. .	. .
8	*.48	. .	. .	.54	. .	.	. .	.05	.16	.01	. .	. .
9	*.05	. .	. .	.75	1.28	. .	. .	. .	.03	. .	. .	. .
10	. .	. .	.	.04	.40	. .	. .	.38	. .	. .	. .	. .
11	. .	. .	. .	.20	. .	. .	. .	.18	.66	.05	. .	. .
12	*.08	. .	. .	.07	. .	. .	. .	. .	.07	.61	. .	.10
13	.95	. .	. .	. .	. .	. .	.06	.04	. .	. .	1.74	. .
14	. .	*.53	. .	. .	. .	. .	. .	. .	3.30	. .	. .	. .
15	. .	. .	.19	. .	.05	. .	. .	. .	.15	. .	. .	. .
16	*.04	. .	. .	*.32	. .	. .	.12	. .	. .	. .	. .	. .
17	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.22
18	. .	. .	*.33	. .	1.27	. .	. .	. .	. .	. .	. .	.01
19	. .	*.14	*.04	*.30	.48	. .	. .	. .	. .	. .	. .	. .
20	. .	. .	. .	. .	. .	. .	. .	.84	. .	.06	. .	. .
21	*.43	.45	. .	. .	. .	. .	. .	. .	. .	.55	. .	. .
22	*.30	.15	.20	. .	. .	.40	.25	. .	. .	. .	. .	. .
23	.05	. .	. .	. .	. .	. .	.09	. .	. .	. .	. .	. .
24	. .	*.21	. .	.06	. .	. .	.13	. .	.08	. .	. .	. .
25	. .	. .	. .	. .	.11	.62	. .	. .	. .	. .	.01	. .
26	.59	. .	. .	.10	.02	. .	.09	. .	.04	.21	. .	. .
27	. .	. .	. .	3.08	.23	. .	. .	. .	. .	. .	. .	1.42
28	*.11	.11	. .	1.77	. .	. .	.05	. .	. .	. .	.	. .
29	. .	.10	. .	.18	. .	.37	. .	. .	.49	. .	.02	. .
30	. .	. .	. .	.01	.39	.18	. .	. .	.05	. .	. .	. .
31	. .	. .	*.15	. .	. .	. .	. .	. .	. .	. .	. .	. .
Total	3.08	2.09	2.07	8.36	4.23	2.77	1.12	2.11	5.03	1.74	1.77	1.89

* Snow.

Total for the year, 36.27.

TABLE V.

SHOWING THE DEPTH OF WATER IN PONDS FOR EACH WEEK DURING 1904

DATE.	FEET.				
	Hawkes Pond.	Breed's Pond.	Birch Pond.	Walden Pond.	Glen Lewis Pond.
January 4	10.3	11.4	9.1	. . .	4 5
January 11	10.4	11 8	8.6	. . .	5.
January 18	10.[illegible]	12.	8.[illegible]	. . .	5 4
January 25	10.[illegible]	12 5	8.6	. . .	5 7
February 1	8.8	11.11	8.7	. . .	[illegible]
February 8	7.	10.3	8 2	. . .	8.
February 15	5	[illegible]	7.8	. . .	8 3
February 22	7.8	8 [illegible]	8.11	. . .	8.11
February 29	10.6	8 8	8.10	. . .	9 2
March 7	14.	7.11	[illegible]	. . .	[illegible]
March 14	15	—	10.8	. . .	12 3
March 21	15.[illegible]	[illegible].11	11 5	. . .	13 [illegible]
March 28	20.6	11 [illegible]	12 9	. . .	15 4
April 4	22	13 [illegible]	12 8	. . .	17 9
April 11	22.[illegible]	15 [illegible]	14 5	. . .	14.1
April 18	22 11	17 3	15.8	1.	17 11
April 25	22 [illegible]	19 11	12 11	15.10	17.11
May 2	23.[illegible]	20.[illegible]	19.[illegible]	15 3	18.1
May 9	24.4	19 11	20 7	15 10	18.10
May 16	23 8	19 7	21 [illegible]	15.5	18.[illegible]
May 23	24.	19.11	22 [illegible]	15 9	18.[illegible]
May 30	24.	19 3	22 7	15 10	18.1[illegible]
June 6	24.5	19 7	21 [illegible]	18.1	18.18
June 13	25.	19 9	19 9	17 10	18.10
June 20	25.5	20.4	15.11	17.10	18 [illegible]
June 27	25 1	20.	15.	17.10	18 8
July 4	25.	19.11	14.11	17.10	18 6
July 11	24.10	19 8	14 8	16 4	18 4
July 18	24.10	19 7	14.6	16	18 4
July 25	24.9	19 4	14.7	16.2	18.
August 1	24 8	19 5	14.8	12 8	17.1
August 8	24 8	19.3	14.0	10.	17.6
August 15	24.6	18.11	14.10	8.2	17.4
August 22	24.1	18.9	14.8	6.	17.2
August 29	24.	18.6	14.4	. . .	17.
September 5	23.9	18.6	14.	. . .	16.4
September 12	23 6	18 6	13 0	. . .	15.10
September 19	22 10	18 9	12.10	. . .	14 6
September 26	22 9	19.	12.5	. . .	12.6
October 3	22.7	19.2	12.	. . .	12.
October 10	22 7	19.4	12.3	. . .	9.10
October 17	22 7	19.5	11 6	. . .	6.2
October 24	22.6	19.3	10.	. . .	. . .
October 31	22 6	19.4	9.	. . .	. . .
November 7	22.5	19 5	8.	. . .	. . .
November 14	22.5	19 6	7.4	. . .	. . .
November 21	22.2	19.6	9.	. . .	. . .
November 28	20.	18.9	8.9	. . .	. . .
December 5	18.10	17.10	8.6	. . .	. . .
December 12	17.6	19.	8.9	3.2	. . .
December 19	14 6	19.	8.9	3.5	. . .
December 26	10.5	19.	8.10	3 10	. . .

TABLE VI.

SHOWING THE LOCATION OF GATES SET IN 1904.

STREET.	LOCATION.
Chatham	On north line of Collins, 18 feet, 8 inches east of west line of Chatham.
Ocean	6 feet, 10 inches east of east line of Nahant, 14 feet north of south line of Ocean.
Ocean	46 feet, 6 inches east of east line of King, 28 feet north of south line of Ocean.
Ocean	4 feet east of east line of Michigan avenue, 21 feet north of south line of Ocean.
Rantoul avenue	On west line of Acorn, 9 feet, 6 inches north of south line of Rantoul avenue.
Rockmere terrace	1 foot east of east line of Commercial, 7 feet, 11 inches north of south line of Rockmere terrace.
South	On south line of Market square, 13 feet, 6 inches west of east line of South.
Summer	2 feet, 6 inches west of west line of South, 22 feet south of north side of Summer.
Summer	27 feet east of east line of Light, 13 feet, 6 inches south of north line of Western avenue.
Western avenue	6 feet, 4 inches east of east line of Fairchild, 5 feet, 9 inches north of south line of Western avenue.
Western avenue	On east line of Ida, 16 feet south of north line of Western avenue.
Western avenue	On west line of Cottage, 16 feet, 9 inches south of north side of Western avenue.
Western avenue	42 feet west of east line of Light, 17 feet, 9 inches south of north line of Western avenue.

TABLE [illegible]—Continued.

STREET	LOCATION
Western avenue....	[illegible], 7 inches west of west line of [illegible], [illegible] feet, [illegible] inches south of south line of Western avenue
Western avenue....	On west line of [illegible], [illegible] feet south of south line of Western avenue
Western avenue....	7 feet west of west line of [illegible], [illegible] feet, 5 inches south of south line of Western avenue
Western avenue....	On west line of [illegible], [illegible] feet, [illegible] inches south of south line of Western avenue
Western avenue....	5 feet, 9 inches east of east line of Washington, 16 feet, 6 inches south of south line of Western avenue.
Western avenue....	22 feet west of west line of Bay View avenue, 22 feet, 4 inches south of south line of Western avenue

TABLE VII.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	Total
Trident	751	814	96	5	6	...	...	1,672
Thomson	146	336	51	12	3	1	1	550
Lambert	509	425	56	9	18	...	...	1,017
Hersey	81	64	1	...	1	...	...	147
Ball and Fitts	26	20	14	...	...	...	...	60
Union	4	21	3	8	7	...	9	52
Nash	49	14	1	...	1	...	...	65
Niagara	30	27	1	...	...	...	...	58
Columbia	44	7	...	...	...	...	...	51
Crown	1	7	1	1	...	...	...	10
Empire	11	11	3	3	4	1	1	34
All others	2	6	3	3	...	2	...	16
Motors . . . 4	...	...	...	...	...	...	...	...
Totals	1,654	1,752	230	41	40	4	11	3,732

TABLE VIII.

SHOWING CONSUMPTION [illegible]

[illegible]

Domestic, non-metered		[illegible]
Manufacturing, metered		[illegible]
Domestic, metered		[illegible]
Loss by [illegible]		[illegible]
Loss by [illegible]		
[illegible]		[illegible]
[illegible]		
Street sprinkling	[illegible]	
Watering troughs	[illegible]	
Schools	[illegible]	
Fire	[illegible]	
Sewers	[illegible]	
Highway Department	[illegible]	
Engine houses	[illegible]	
Fountains	[illegible]	
City Hall	[illegible]	
Police Station	[illegible]	
Health Department	[illegible]	
Cemeteries	[illegible]	
Public Library	[illegible]	
Water Department	[illegible]	
All others	[illegible]	
		[illegible]
Total		[illegible]

TABLE IX.

SHOWING TOTAL LENGTH AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS

	6 in.	4 in.	1½ in.	1 in.	¾ in.	⅝ in.	Total
Lynn	140	930	700	5,043	[illegible]	111	[illegible]
Saugus	[illegible]	53	....	971	[illegible]	..	[illegible]
Total	145	983	700	[illegible]	[illegible]	111	[illegible]

TABLE X.

SHOWING THE SIZE AND TOTAL LENGTH OF IRON PIPE LAID IN 1904.

WHERE LAID.	12 in.	10 in.	8 in.	6 in.	4 in.	Total.
Acorn*	...	...	...	450	...	450
Chatham*	...	...	...	2,160	...	2,160
Cleveland*	...	...	...	...	365	365
Cliff†	...	...	...	754	...	754
Gage*	...	...	...	...	412	412
Ingalls*	...	...	...	977	...	977
Lewis*	...	2,173	...	...	...	2,173
Maple*	...	...	1,636	...	...	1,636
Ocean*	...	975	2,242	...	...	3,217
Rockmere terrace*	...	...	...	...	362	362
Summer*	...	...	1,432	787	...	2,219
Western avenue*	1,840	5,152	...	...	...	6,992
	1,840	8,300	5,310	5,128	1,139	21,717

	MILES.	FEET.
*Total length relaid	4	
†Total length extended		754
Total length new		362
Total length system	135	1,241
Total in Swampscott		1,788
Total in Saugus	19	200

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SUMMARY OF STATISTICS.

For the Year Ending December 31, 1904.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population by census of 1900,	68,513
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and river
Mode of supply,	Pumping to reservoir

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a*. Kind, soft.
   - *b*. Brand of coal used, Georges Creek.
   - *c*. Average price of coal per gross ton, delivered, $4.75.
   - *d*. Percentage of ash, 11.18.
   - *e*. Wood, price per cord.
3. Coal consumed for the year, in pounds,

	Loretz.	Leavitt.
	3,531,500	16,500

	Loretz.	Leavitt.
4. [Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,	320	
4*a*. Amount of other fuel used,		
5. Total equivalent coal consumed for the year =(3)+(4), in pounds,	3,531,820	16,500
6. Total pumpage for the year, in gallons, with allowance for slip,	1,943,952,500	9,266,200
7. Average static head against which pumps work, in feet,	151.35	154.20
8. Average dynamic head against which pumps work, in feet,	153.22	154.70
9. Number of gallons pumped per pound of equivalent coal (5),	550.4	561.5

10. $$\text{Duty} = \frac{\text{gallons pumped (6)} \times \text{S.34 (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5).}}$$

Loretz.	Leavitt.
79,193,335	82,126,041

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES VIZ., $15,896.45.

11. Per million gallons pumped,	$8.14
12. Per million gallons raised one foot (dynamic),	$.005⅓

FINANCIAL STATISTICS.

RECEIPTS.

(*a*) From ordinary (maintenance) receipts,		$225,119.49
(*b*) From extraordinary receipts (bonds, etc.),		99,213.58
Total,		$324,333.07
From Water Rates:		
A. Fixture rates,	$110,890.67	
B. Meter rates,	103,824.10	
C. Total from consumers,		$214,714.77
L. From bond issue,		99,213 58
M. From other sources,		10,404.72
N. Total,		$324,333.07

EXPENDITURES.

Water Works Maintenance:		
AA. Operation (management and repairs),	$108,327.61	
CC. Total maintenance,		$108,327.61
DD. Interest on bonds,		85,791.88
FF. Sinking Fund,		31,000.00
Water Works Construction:		
HH. Extension of services,	$9,048.62	
JJ. Increased storage,	83,728.16	
KK. Total construction		92,776.78
Total balance,		6,436.80
N. Total,		$324,333.07

DISPOSITION OF BALANCE, TO CONSTRUCTION, 1905.

O.	Net cost of works to date,	$2,000,890.89
P.	Bonded debt at date,	2,160,000.00
Q.	Value of Sinking Fund at date,	746,585.78
R.	Average rate of interest, 4 per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1.	Estimated population at date,	83,500
2.	Estimated population on lines of pipe,	82,500
3.	Estimated population supplied,	82,500
4.	Total consumption for the year (gallons),	1,952,018,566
5.	Passed through meters (gallons),	550,000,000
6.	Percentage of consumption metered,	25 per cent.
7.	Average daily consumption in gallons,	5,333,384
8.	Gallons per day to each inhabitant,	63.76
9.	Gallons per day to each consumer,	64.78
10.	Gallons per day to each tap,	365
11.	Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$48.00
12.	Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$100.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1.	Kind of pipe,	Cement-lined, and cast-iron.
2.	Sizes,	From 36 to 4 inch.
3.	Extended during year (feet),	754

4. Discontinued during year (feet),	None.
5. Total now in use (miles),	135
6. Cost of repairs per mile,	[illegible]
7. Number of leaks per mile,	1.08
8. Length of pipes less than 4 inches diameter (miles),	
9. Number of hydrants added during year (public and private),	2
10. Number of hydrants (public and private), now in use,	[illegible]
11. Number of stop gates added during year,	47
12. Number of stop gates now in use,	[illegible]
13. Number of stop gates smaller than 4-inch,	
14. Number of blow-offs,	[illegible]
15. Range of pressure on mains (pounds),	40 to 90

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	[illegible]
18. Extended (feet),	11,947
19. Discontinued (feet),	418
20. Total now in use (miles),	104
21. Number of service taps added during year,	[illegible]
22. Number now in use,	13,447
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	194

26. Number now in use,	3,732
27. Percentage of services metered,	25 per cent.
28. Percentage of receipts from metered water (B + C),	23 per cent.
29. Number of motors and elevators added,	
30. Number now in use,	7

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CITY OF LYNN

ANNUAL REPORT
Public Water Board

1905

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1905.

Compliments of

Public Water Board,

WM. B. LITTLEFIELD, *Pres.*

LYNN, MASS.
FRANK S. WHITTEN PRINTER
1906

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1905.

LYNN, MASS.
FRANK S. WHITTEN, PRINTER
1906

PUBLIC WATER BOARD FOR 1900.

W. B. Littlefield, *Pres.*, for four years.

James Burns, for one year.

C. E. Sprague, for two years.

Thomas P. Nichols, for three years.

S. W. Dearborn, for five years.

[illegible]

[illegible]

[illegible]

William F. [illegible]

Superintendent and [illegible]

[illegible] Registrar, [illegible]

Pumping Engineer, C. A. [illegible]

Assistant Engineer, George H. [illegible]

Foreman of Mains, Edwin [illegible]

Foreman of Services, Henry [illegible]

Foreman of Meters and Repairs, W. H. [illegible]

INSPECTORS.

Winslow J. Rowell,	W. H. [illegible]
J. Frank Pool,	John [illegible]

CLERKS.

Mabel R. Butler,	[illegible]

ANNUAL REPORT.

To the Honorable Mayor and City Council:

GENTLEMEN,—The Public Water Board, in conformity with the charter and ordinances, have the honor to present this thirty-fourth annual report, together with the reports of the Superintendent and Registrar.

Water Supply.

The area from which the city has a right to take water comprises the water-shed of the Saugus River, above the dam at Montrose, exclusive of the water-shed of Lake Quannapowitt, the water-sheds of Breed's Pond, Birch Pond, Hawkes Pond and Walden Pond and the right to take Ipswich River and its tributaries. By an Act of the Legislature of 1901:

CHAPTER 508, ACTS OF 1901

AN ACT TO AUTHORIZE THE CITY OF LYNN TO TAKE AN ADDITIONAL WATER SUPPLY.

Be it enacted, etc., as follows:

SECTION 1. The city of Lynn may, for the purpose of providing an additional water supply for itself and its inhabitants, take by purchase or otherwise, the water of Ipswich River and its tributaries including Martin's Pond above the point where said Ipswich River intersects the junction of the boundary line of the towns of Lynnfield, North Reading, and Middleton, reserving to the owners the right to use such waters as shall flow to said mills, and the dams connected therewith, except so far as said city shall from time to time actually divert and use the same for the purposes named in this Act: provided, that the city of Lynn shall not take water from the Ipswich River except when the daily flow of said river at the paper mill dam in the town of Middleton shall exceed ten million gallons, and then at such times said city may take all the flow of said river in excess of ten million gallons and no more, and shall only exercise the right to take the waters above mentioned during the months of December, January, February, March, April and May.

The Saugus River water-shed is connected with Hawkes Pond by a conduit capable of delivering about 30,000,000 gallons of water per day. These sources are all connected with each other and with the pumping station, except the Ipswich River and its tributaries. By advice from the State Board of Health, the Water Board in 1906 contemplate the laying of a pipe or conduit from Montrose and connect with Pillings Pond Brook, and Beaver Dam Brook and discontinue the use of that portion of Saugus River that flows from Lake Quannapowitt as a source of supply. The Board will in the future, extend this line of pipe to connect with the Ipswich River in Reading, and when conpleted, the water will flow by gravity to our present system. With this additional supply, the city will be amply provided with water for many years.

Walden Pond Dam.

Walden Pond Dam was completed on November 28th, 1905 and inspected by the Water Board in company with George I. Leland, City Engineer, Lucian A. Taylor, Consulting Engineer, and County Commissioners, with F. L. Fuller, their Consulting Engineer, and all present expressed themselves pleased with the very satisfactory manner in which the work was done.

We submit following reports from Lucian A. Taylor, Consulting Engineer for the Lynn Public Water Broad and F. L. Fuller Consulting Engineer of the Board of Commissioners for Essex County:

BOSTON, MASS., November 27th, 1905.

To the Public Water Board, Lynn, Mass:

GENTLEMEN,—As the Walden Pond dam is practically completed and the time for a final estimate and settlement with the contractor is at hand, there are some questions it seems to your engineer that should be touched upon, principally the length of time required and the cost of the structure viewed from an engineer's standpoint.

The first item that comes to mind in looking over the contract would seem to be the matter of forfeiture that might be demanded of the contractor for not finishing the work according to the time specified in the contract.

[illegible] excavating to solid rock in the core trench. [illegible] a large addition to and change in equipment for doing the work. It was essential this work should be done [illegible] practically [illegible] the reservoir [illegible]. The water was not drawn from the reservoir [illegible] somewhat delayed the beginning of this portion of the work. This work required several months' time and was not originally anticipated, so there is no question, it seems to your engineer, but the contractor would be entitled to an extension of time accordingly. This extension of time would practically amount to one year as it would not have been wise, in the opinion of your engineer, to have permitted a large force during the following summer with the reservoir full [illegible] the idleness of a very large plant of the contractor that he had been using during the early portion of the work. [illegible] years of [illegible] and [illegible] the water supply of the city was such that the reservoir was not empty until the late of the season to accomplish a large amount of work after that time. There seems to have been no way to guard against this condition as the supply of water for the reservoir is dependent upon the amount of rainfall and the consumption, and it was absolutely essential that there should be no water famine.

It must be borne in mind that principally owing to inaccuracies in the original contours, and also some variation in the alignment in lengthening the embankment, and a greater amount of stripping than had been estimated, the amount of embankment was increased [illegible] cubic yards in round numbers. This additional amount of embankment would entitle the contracter to an extension of time adequate to do the work.

In the matter of slope paving there is an apparent, although really not a very great inaccuracy. The original estimate called for [illegible] cubic yards of slope paving. The price was submitted and the contract let upon the basis of a certain price per square yard and the amount required would be 10,500 square yards. Owing principally to the lengthening of the embankment and change in alignment this has been increased about 1,700 square yards.

It has also been necessary to tear down and re-build the gate chamber as it was found that the old one could not be safely used as had been contemplated owing to defective foundation. This change was made, as other changes were made, by the engineer as being essential to the permanency and integrity of the work.

Owing chiefly to the additional time required to excavate and build the section of core wall where the sheet piling was placed and the delay caused the contractor by not emptying the reservoir as soon as had been contemplated and which could not have been safely done by the Water Board owing to the conditions of the supply, also to the increased amount of embankment, it seems to your engineer it would be unwise for the Water Board to undertake to collect the penalty expressed in the contract as it would seem that the contractor might have counter claims that would more than off-set the sum claimed by the Water Board.

It would in fact have been impracticable to have completed the entire amount of work within the time specified, and also it must have been to the detriment of the structure to have had it so hastily built. It has been greatly to the advantage of the work that the time has been lengthened and your engineer has felt that the Water Board was benefited by reason of that fact.

It is perhaps not amiss at this time to call attention to the fact that notwithstanding the much greater amount of work accomplished, some of it of a very expensive character, that it has all been done for practically the amount of the original estimated cost, which was $298,600, and the opinion of your engineer at that time and now is that that estimate was a very conservative one, and the variation of about one per cent, it seems to your engineer to be quite unusual.

The work as now constructed has had sufficient time to become compacted, solidified and settled together to such an extent that there would seem to be no doubt of its solidity and the Water Board would be justified in accepting the work at once. It seems to your engineer that the Water Board can congratulate itself upon the completion of so great an undertaking at so small an expense for the amount of water impounded and for so slight a variation from the amount of the original estimated cost.

Yours very truly,

LUCIAN A. TAYLOR,
Constructing Engineer

BOSTON, MASS., December 2, 1905.

To the Board of Commissioners for Essex County, Salem, Mass.:

GENTLEMEN,—At your request I visited and examined the work being done on the Walden Pond dam, in the City of Lynn, on April 8, 1903 and on November 28, 1905. The result of my observations is herewith briefly described.

CONCRETE CORE WALL.

This wall, which is to prevent percolation of water through the dam, is of boulder concrete, made by ramming and settling boulders and quarry stone of suitable size into the soft, unset concrete. As I saw the wall during construction, it was solid and substantial and of adequate thickness.

This form of concrete construction is particularly well suited to the requirements of a core wall, where strength, weight and tightness are of the greatest importance. The addition of a plaster coat of Portland cement and sand on the up-stream or reservoir side of the wall, and the further application of two brush coats of neat cement over this plaster coat, ought to insure water tightness.

As engineer, I have three storage water works reservoirs nearly completed, the walls of which are built of boulder concrete. One similarly built in 1903 has given entire satisfaction.

THE EMBANKMENT

The embankment is of ample thickness and of good material, and, as I have seen it, appears to be well compacted. Having been several years in building, the settlement has been gradual and uniform, which is a decided advantage, tending to greater security.

INSIDE SLOPE.

The reservoir side of the embankment is protected by heavy slope paving of heavy rubble stone, the smoothest surface or face, being the one exposed and forming the slope. The irregular spaces between the large stones are filled with smaller ones, well driven, binding the paving together and holding it in place.

At the time of my last visit, the paving, which was nearly completed, was being laid to a true surface, conforming to batter boards placed for that purpose.

The object of this paving, or rip-rap, is to protect the embankment from the action of waves and ice.

Over a small portion of the inside slope a layer of concrete, which appeared in good condition, was used instead of the stone paving, to protect the embankment.

OUTSIDE SLOPE.

The down-stream slope of the embankment is covered with a layer of loam which has been seeded to grass. It has been carefully graded and when the grass has grown, will present an attractive appearance. Moreover the turf thus formed, will be of great service in protecting the bank from being washed by the rain.

GATE CHAMBER AND HOUSE.

To contain the gates which control the outflow, a substantial concrete gate chamber has been built at the foot of the inside slope. The walls of this chamber decrease in thickness from the bottom to the top. Above present high water level, the chamber is surmounted by a brick house of good design, having the necessary door and windows. Water is admitted from the pond at different convenient elevations, through gates operated by hand wheels placed in the gate house.

An iron bridge will give access to the gate house from the top of the embankment.

CHARACTER OF THE WORK.

The quality of the work, from appearances and observations at the time of my visits is excellent, and I have no hesitation in believing that the dam will successfully fulfill all reasonable demands made upon it.

Yours respectfully,

F. L. FULLER.

The quality of the work has at all times been the best, and the core wall built with high grade of Portland cement, ranks with the first of any in the state.

The members of the Board are exceedingly gratified that the work has been completed without any extras which frequently occurs in a work of such magnitude. A change in the lines of the dam and an increase in the depth of the trench for the foundation of the core wall increased the number of cubic yards of work to be done over the estimate. This work has been done as per contract foı the various sums bid per cubic yard, the contractor only receiving pay for work actually done per cubic yard as per prices bid.

The completion of the work gives to the city an exceptional reservoir. Its surrounding hills and steep banks insure a good depth of water upon the entire surface of the reservoir which will prevent any considerable amount of vegetable growth.

Our storage system comprises the following reservoirs:

Ponds	Acres	Capacity in gallons
Breed's pond	54.85	262,563,340
Birch pond	82.00	381,062,901
Hawkes pond	75.00	300,000,000
Walden pond including Glen Lewis	240.00	1,754,157,030
Total		2,697,783,271

We may be unable to fill Walden Pond to its full capacity this present year. Should we be fortunate enough to [illegible] the first of the old dam [illegible] full at the first of May, we will then have water enough in store for one year's supply. The additions to the dam will give us an increase of [illegible] gallons of water with a [illegible] about [illegible] gallons in all of the ponds.

The Walden pond reservoir when filled with water, will include Glen Lewis Pond and will be called Walden Pond, with a capacity of [illegible] gallons of water, [illegible] supply. Our total storage capacity is [illegible] gallons.

Cleaning and grubbing of the shores on the north side of Walden Pond will be completed in the early spring in order not to interfere with the filling of the pond. It will be necessary to build a short dike at the end of Glen Lewis Pond to the grade of high water line; it will require filling about [illegible] feet at the lowest point.

Pumps.

Referring to our annual report of 1904 it shows that plans were submitted by Loretz & Son for an entire new pumping outfit to connect with the Leavitt engine; and the pumps were connected with pipe leading to Breed's and Birch Ponds that we might receive the full benefit of the various pressures of the ponds, thereby reducing the running expense. I will state the Leavitt engine has been in service 32 years and on examination was found to be in excellent condition.

After the completion of the work of connecting the pumps, they were started up February 27, 1905, for the purpose of repairing the Loretz 10,000,000 gallons high duty pump, which has been in operation about 16 years, with very few repairs, since they were installed. The pumps are being put in first class condition, and when finished will be equal to do the work of new pumps.

STATEMENT.

WATER DEBT.

Amount of debt December 19, 1904	$2,160,000	
Bonds matured and paid in 1905	421,500	
	$1,738,500	
New loans in 1905	60,000	
Amount of debt December 19, 1905		$1,798,500 00

SINKING FUND.

Amount of funds December 19, 1904	$ 715,585 78	
Received from City Treasurer in 1905	31,000 00	
Earnings of sinking funds in 1905	14,922 36	
	$761,508 14	
Deduct bonds paid within the year	421,500 00	
	$340,008 14	
Amount in hands of Treasurer December 19, 1905	46,000 00	
		$386,008 14
Net total debt		$1,412,491 86

Water Maintenance.

RECEIPTS.

From water rates	$239,611 01	
From interest on loan	336 39	
From overdraft	10 00	
		$239,957 40

EXPENDITURES.

For maintenance	$116,666 15	
For interest	77,291 25	
		$193,957 40
Net income for year ending December 19, 1905		$46,000 00

REPORT OF WATER REGISTRAR.

OFFICE OF THE PUBLIC WATER BOARD,
LYNN, MASS., January 1, 1906.

To William B. Littlefield, President:

SIR,—I herewith present the financial condition of the department for the year ending December 31, 1905.

RECEIPTS FOR 1905.

Fixture rates	$112,907 94	
Meter rates	116,764 65	
Miscellaneous	7,182 23	
Additional rates	1,365 36	
Fines	45 50	
Total revenue		$238,265 78
Extra pipe		3,570 69
Total receipts as per cash book		$241,836 47

COMPARATIVE STATEMENT OF REVENUE.

Amount collected during the year		$238,265 78
Amount outstanding, fixture rates	$22,411 60	
Amount outstanding, meter rates	8,964 74	
Amount outstanding (not due) meter rates	25,682 36	
		57,058 70
		$295,324 48
Deduct amount due January 1, 1905		54,848 75
Revenue for 1905		$240,475 73
Revenue for 1904		233,706 83
Increase		$6,768 90

STATEMENT OF NET EARNINGS FOR 1905.

Revenue		$240,475 73
EXPENSES.		
Maintenance	$113,034 55	
Interest	77,291 25	
Rebate to Saugus	5,150 00	
		195,475 80
		$44,999 93

EXPENDITURES FOR THE YEAR 1905.

MAINTENANCE.

Mains	$32,480 00	
Services	18,022 83	
Pumping expenses, Walnut street	14,105 54	
Salaries and office expenses	11,253 20	
Engines and boilers, Walnut street	8,446 36	
Walden Pond	6,817 91	
Meters	6,751 27	
Pumping expenses, Walden Pond	3,717 01	
Stable and shop	3,184 73	
Miscellaneous	2,192 40	
Canal at Hawkes Pond dam	2,026 35	
Damages	1,956 80	
Gate chamber Walden Pond	995 09	
Hawkes Pond	586 41	
Moths	373 00	
Engine house	75 50	
Birch Pond	33 40	
Reservoir	16 75	
		$113,034 55

CONSTRUCTION.

Walden Pond dam	$65,573 64	
Services	2,346 32	
Gate chamber	402 00	
Mains	61 37	
		$68,383 33
Less amount received for pipe		3,570 69
Net		$64,812 64

STATEMENT.

SHOWING COST OF WORKS TO JANUARY 1, 1906.

Mains, hydrants and gates	$883,362	99
Walden and Glen Lewis Ponds	562,095	94
New supply and land	338,595	27
Services and courts	335,736	68
Engines and boilers	140,327	29
Hawkes Pond	161,036	53
Reservoirs and land	131,581	49
Birch Pond and land	93,471	84
Engine house, pump and conduit, Walden Pond,	83,003	72
Engine house and land	57,562	39
Breed's Pond and land	57,135	28
Pipe conduits and land	81,289	39
Hawkes Pond canal	47,947	33
Force mains and land	41,546	13
Meters	37,531	42
Stand-pipe and pumping machinery	34,274	07
Highland service	12,431	17
Engineering	11,157	95
Tubular wells	9,470	02
Workshop and stable	2,056	97
Compressor	515	00
	$3,122,319	18
Less amount received for pipe	156,615	65
Total net cost	$2,965,703	53

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Number of services in Lynn	12,420	
Number of services in Saugus	1,136	
Total		13,556
Number put in during the year (Lynn)	331	
Number put in during the year (Saugus)	49	
Total		380
Number extended during the year (Lynn)	27	
Number extended during the year (Saugus)	3	
Total		30
Renewed	209	
Number discontinued	13	
Number not in use	31	
Turned on (new services)	97	
Turned on (reoccupied)	64	
Turned on (repairs)	67	
Shut off (for vacancy)	41	
Shut off (for non-payment)	16	
Shut off (for repairs)	75	

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1905.

	LYNN.	SAUGUS.	TOTAL
Dwellings	12,300	1,110	13,410
Stores and shops	1,250	50	1,300
Factories	217	4	221
Offices	520	17	537
Restaurants and saloons	80	..	80
School-houses	60	9	69
Churches	33	5	38
Bakeries	30	..	30
Laundries	20	..	20
Engine houses	12	3	15
Families	17,470	1,217	18,687
Boarding-houses	227	3	230
Faucets	32,448	2,019	34,467
Water-closets	15,119	575	15,694
Bath tubs	5,490	374	5,864
Hose bibs	3,251	190	3,441
Urinals	193	8	201
Heaters	350	76	426
Stationary engines	167	7	174
Motors	25	..	25
Greenhouses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	20	1	21
Stand-pipes for water-carts	79	..	79
Sewer connections	25	..	25
Automatic sprinklers	112	5	117
Hydrants	810	162	972
Hydrants for car sprinklers	44	1	45

STATEMENT.

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989	00
From January 1, 1872, to January 1, 1873	27,568	15
From January 1, 1873, to January 1, 1874	47,992	61
From January 1, 1874, to January 1, 1875	53,545	61
From January 1, 1875, to January 1, 1876	52,553	26
From January 1, 1876, to January 1, 1877	60,807	12
From January 1, 1877, to January 1, 1878	64,002	50
From January 1, 1878, to January 1, 1879	67,570	14
From January 1, 1879, to January 1, 1880	73,949	80
From January 1, 1880, to January 1, 1881	79,635	12
From January 1, 1881, to January 1, 1882	80,967	76
From January 1, 1882, to January 1, 1883	94,419	52
From January 1, 1883, to January 1, 1884	98,893	54
From January 1, 1884, to January 1, 1885	114,903	86
From January 1, 1885, to January 1, 1886	110,089	11
From January 1, 1886, to January 1, 1887	116,573	70
From January 1, 1887, to January 1, 1888	123,507	73
From January 1, 1888, to January 1, 1889	134,480	77
From January 1. 1889, to January 1, 1890	141,865	53
From January 1, 1890, to January 1, 1891	154,788	27
From January 1, 1891, to January 1, 1892	171,744	85
From January 1, 1892, to January 1, 1893	188,979	88
From January 1, 1893, to January 1, 1894	177,803	56
From January 1, 1894, to January 1, 1895	176,655	50
From January 1, 1895, to January 1, 1896	185,572	88
From January 1, 1896, to January 1, 1897	190,531	33
From January 1, 1897, to January 1, 1898	183,711	97
From January 1, 1898, to January 1, 1899	186,658	35
From January 1, 1899, to January 1, 1900	193,699	01
From January 1, 1900, to January 1, 1901	199,003	54
From January 1, 1901, to January 1, 1902	203,078	45
From January 1, 1902, to January 1, 1903	215,692	03
From January 1, 1903, to January 1, 1904	224,440	44
From January 1, 1904, to January 1, 1905	233,706	83
From January 1, 1905, to January 1, 1906	240,475	73
	$4,678,717	96

FUNDED WATER LOAN.

When Payable.		Rate Per Cent.	Amount.
April	1, 1906	3½	$10,000
April	1, 1907	3½	10,000
April	1, 1908	3½	10,000
April	1, 1909	3½	10,000
October	1, 1909	3½	100,000
April	1, 1910	3½	10,000
April	1, 1911	3½	10,000
November	1, 1913	4	20,000
November	1, 1914	3¾	31,000
March	15, 1915	4	50,000
December	1, 1914	4	20,000
December	1, 1915	3¾	6,000
April	1, 1916	3½	2,000
May	1, 1916	3½	24,500
September	1, 1916	4	10,000
October	1, 1916	4	9,000
February	1, 1917	3½	6,500
June	1, 1917	3½	3,500
July	1, 1917	4	7,500
August	1, 1917	4	5,000
October	1, 1917	4	2,000
November	1, 1917	4	6,500
April	1, 1918	4	15,000
June	1, 1918	4	10,000
July	1, 1918	4	50,000
April	1, 1919	4	100,000
July	1, 1919	4	110,000
January	1, 1920	4	35,000
April	1, 1920	4	150,000
April	1, 1921	4	50,000
October	1, 1921	4	25,000
January	1, 1922	4	50,000
July	1, 1922	4	25,000
April	1, 1923	4	40,000
July	1, 1925	4	165,000
July	1, 1926	4	50,000
September	1, 1927	4	25,000
July	1, 1928	4	25,000
October	1, 1928	4	10,000
July	1, 1929	4	25,000
January	1, 1930	4	25,000
October	1, 1930	4	25,000
July	1, 1931	3½	25,000
January	1, 1932	3½	75,000
April	1, 1932	3½	325,000
			$1,798,500

REPORT OF SUPERINTENDENT.

To the Public Water Board:

GENTLEMEN,—In compliance with the city ordinance I herewith present the annual report of the Superintendent for the year ending December 31, 1905.

Water Supply.

The following ponds have contributed to the water supply during the past year:

Ponds.	Gallons	Gallons.
Breed's	365,279,609	
Birch	794,777,025	
Walden	416,722,200	
Hawkes	222,388,441	
Total pumpage in 1905		1,799,167,275
Total pumpage in 1904		1,953,218,700
Showing a decrease in pumpage the past year		154,051,425
Total consumption of water in 1904		1,952,018,566
Total consumption of water in 1905		1,797,099,455

A decrease in consumption the past year of 154,919,111 gallons from that of the preceding year.

On June 1st, 1904 the several ponds contained 1,432,717,553 gallons of water.

On June 1st, 1905, the several ponds contained 1,006,481,956 gallons, a decrease in store from 1904 of 426,235,597 gallons.

This shortage so early in the season was sufficient cause for great anxiety to the members of the Water Board, fearing the danger of a water famine.

The Water Board had inserted in Lynn daily papers a notice that the citizens should take every precaution against the waste of water, also, issued a circular, delivered to the water takers of

Lynn and Saugus, urgently requesting them not to use hose for sprinkling lawns, but one-half hour a day, and that each individual must use one-third less water.

It is evident that the request of the Board received favorable consideration of many of the citizens, as statistics prove the decreased consumption of water was 424,436 gallons per day, equal to 154,919,140 gallons for the year. To this should be added the yearly increase of 76,820,920 gallons, making a saving of 231,740,031 gallons of water, by the aid and co-operation of the citizens.

The heavy rainfall in September of $6\frac{22}{100}$ inches gave us an increase of 199,610,844 gallons of water during the month.

This amount added to the above amount of 231,740,031 gallons gives a total of 431,314,875 millions of gallons, showing an increase of a few million gallons more, than on the first of June, 1905. Owing to the mild weather in December the decrease in consumption was 935,513 gallons per day during the month, the largest decrease during any one month in the year, thereby a saving of 29,000,000 gallons of water.

Court Pipes Laid in 1905.

Beaudry place from 144 Lawton avenue, 192 feet of 2-inch galvanized iron pipe.

Canal street from River street, 405 feet 2-inch galvanized iron pipe.

Court from 293 Boston street, 127 feet 1½-inch galvanized iron pipe.

Court from Western avenue 100 feet 2-inch galvanized iron pipe.

Court from 287 Summer street, 165 feet 1½-inch galvanized iron pipe.

Court from Woodman street, 115 feet 1¼-inch galvanized iron pipe.

Eunice terrace, 157 feet 1½-inch galvanized iron pipe.

Hunnewell place from Bessom street, 122 feet 1½-inch and 76 feet 1¼-inch galvanized iron pipe.

Lexington court, 161 feet 1½-inch galvanized iron pipe.

New Main Pipe.

Boulevard from Ocean street to Prescott place, 2,897 feet of 6-inch cast-iron pipe.

Main Pipe Extended.

Essex avenue, 109 feet 2-inch galvanized iron pipe.
Herschel street, 441 feet of 6-inch cast-iron pipe.
Pitkin street, 10 feet of 10-inch cast-iron pipe.
Tracy avenue, 96 feet of 6-inch cast-iron pipe.
King street, 38 feet 4-inch cast-iron pipe.
Wolcott road, 50 feet 4-inch cast-iron pipe.

Main Pipe Relaid.

Bowler and Lake streets from Pond street to Maple street, 1,232 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Chatham street from Parrott street to Bloomfield street, 600 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Commercial street from Summer street to Alley street, 1,577 feet of 6-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

Commercial street from South Common street to Summer street, 984 feet of 4-inch cement-lined pipe removed and relaid with 6 inch cast-iron pipe.

City Hall square, 250 feet of 12-inch and 48 feet of 6-inch cement-lined pipe removed and relaid with 250 feet of 12-inch and 48 feet of 6-inch cast-iron pipe.

Elm street from Market square to Summer street, 1,140 feet of 16-inch cement lined pipe removed and relaid with 16-inch cast-iron pipe.

Ezra street from Pinkham street to Mailey street, 293 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Herbert street from High Rock street to Hollingsworth street, 338 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Hollingsworth street from Herbert street to Bay View avenue, 401 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Lawton avenue from High Rock street to Essex street 755 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Mailey street from Union street to Ezra street, 452 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Maple street from Chestnut street to Chatham street, 1,845 feet 6-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

North Common street from Mall street to Western avenue, 853 feet of 10-inch cement-lined pipe removed and relaid with 10-inch cast-iron pipe.

Pinkham street from Union street to Ezra street, 438 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Pond street from Chestnut street to Bowler street, 761 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

River and Camden streets, 763 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

South street from Summer street to Neptune street, 702 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Summer street from Elm street to Commercial street, 583 feet of 16-inch cement-lined pipe removed and relaid with 16-inch cast-iron pipe.

Williams avenue from Fayette street to Chatham street, 770 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Services.

New services in Lynn	331
New services in Saugus	40
Services extended, Lynn and Saugus	30
Services discontinued	13

Services renewed	209
Services changed from old main to new	362
Services lowered	13
Services repaired	44
Service, leaks repaired	375
Services frozen	464
Service pipes cleaned out, no force	1,770
New service boxes	380
New service boxes in place of old	39
Service boxes repaired and set	48
Number of feet of lead-lined pipe	24,648
Number feet galvanized iron pipe	857
Lead connections renewed with corporations	396
Lead connections renewed without corporations	102
New meters	358
Meters repaired	692
Meters changed	2
Meters reset	8
Meters exchanged	71
Meters frozen	26
Meters repacked	56
Meters discontinued	27
Meter boxes new	3
Meter boxes repaired	4
Finding and raising main gate-boxes	55
Main gate-boxes repaired	8
Fire hydrants new	22
Fire hydrants repaired	57
Fire hydrants frozen	4
Fire hydrants moved	8
Private hydrants repaired	8
Houses inspected Lynn and Saugus	19,683

Leaks Reported and Notices Issued.

Faucets	199	
Water closets	1,082	
Bath tubs	10	
Pipe bursts	5	
		1,296
Bills and notices delivered	45,500	
Meters read	6,500	
Meters read quarterly	3,277	
Meters read monthly	540	
		55,817

[illegible]

[illegible]
[illegible]
[illegible]
New [illegible]
[illegible]
[illegible]
[illegible]
New [illegible]

Respectfully submitted,

[illegible]

[illegible]

Microscopical Examination of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1905.	January 13.	March 15.	May 11.	May 16.	July 18.	September 15.	November 17.			
Number of Sample	52678	53223	54103	54189	55311	56752	58175			
Plants.										
DIATOMACEÆ:	21	3	170	292	298	522	9			
Asterionella	11	0	10	6	0	482	7			
Cyclotella	2	0	1	0	256	6	0			
Melosira	0	0	53	16	0	0	0			
Synedra	4	2	47	168	10	10	2			
Tabellaria	0	0	0	100	32	22	0			
CYANOPHYCEÆ:	0	0	1	0	18	53	12			
Anabæna	0	0	0	0	18	51	12			
ALGÆ:	3	0	2	2	4	32	0			
Animals.										
INFUSORIA:	5	0	1	22	8	54	48			
Dinobryon	0	0	0	0	0	12	44			
Mallomonas	1	0	0	2	2	22	3			
Trachelomonas	0	0	0	2	6	18	0			
Raphidomonas	0	0	0	16	0	2	0			
Uroglena	0	0	0	0	0	0	1			
VERMES:	0	0	2	2	0	0	0			
CRUSTACEA: (Cyclops)	0	0	.02	0	.04	.02	0			
MISCELLANEOUS:										
Crenothrix	0	0	0	0	0	2	0			
Zoöglœa	3	2	5	5	2	5	2			
Total	32	5	181	284	323	330	668	71		

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1905.	January 14.	March 15.	May 11.	May 16.	July 18.	September 15.	November 17.
Number of Sample . .	52076	53224	54104	54[illegible]	555[illegible]	57753	58[illegible]
Plants.							
DIATOMACEÆ:	24	0	86	216	201	150	410
Asterionella	12	0	38	32	4	99	244
Synedra	2	0	14	90	0	8	146
Tabellaria	10	0	32	94	196	43	20
CYANOPHYCEÆ:	0	0	0	0	4	7	0
Anabæna	0	0	0	0	2	7	0
ALGÆ:	0	0	2	4	11	1	5
Animals.							
INFUSORIA:	1	0	76	50	16	7	14
Dinobryon	0	0	44	30	5	4	2
Glenodinium	0	0	20	12	0	0	4
Uroglena	0	0	0	0	0	0	0
VERMES: (Asplanchna)	0	1	2	0	0	0	0
CRUSTACEA: Cyclops)	.02	0	.02	.02	0	.82	.04
MISCELLANEOUS: Zoöglœa	3	1	3	5	3	4	3
Total	28	2	169	275	235	169	431

Microscopical Examination of Water from Glen Lewis Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1905.	May 11.	July 18.	September 15.	November 17.								
Number of Sample . .	54106	55314	56754	58177								
Plants.												
DIATOMACEÆ:	132	29	57	78								
Asterionella	0	0	12	59								
Synedra	52	24	32	5								
Tabellaria	72	4	8	14								
CYANOPHYCEÆ:	12	2	0	1								
Anabæna	12	0	0	0								
ALGÆ:	168	59	40	15								
Protococcus	144	3	0	6								
Animals.												
INFUSORIA:	184	1	76	1								
Dinobryon	180	0	70	0								
VERMES: (Polyarthra)	0	0	1	0								
CRUSTACEA:	0	0	0	0								
MISCELLANEOUS: Zoöglœa	3	3	3	3								
Total	499	94	177	98								

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1905.	January 13.	March 15.	May 11.	May 16.	July 18.	September 15.	November 17.
Number of Sample . .	52680	53285	54105	54108	55813	56755	58175
Plants.							
DIATOMACEÆ:	2	0	45	176	40	33	71
Synedra	0	0	0	84	3	0	15
Tabellaria	1	0	23	66	1	7	27
CYANOPHYCEÆ:	0	0	0	0	0	4	0
Anabæna	0	0	0	0	0	3	0
ALGÆ:	0	0	2	0	5	0	2
Animals.							
INFUSORIA:	2	0	2	12	3	26	5
Dinobryon	0	0	0	0	0	22	0
VERMES:	0	0	0	0	0	0	0
CRUSTACEA: (Cyclops)	0	0	0	0	.08	0	0
MISCELLANEOUS:							
Crenathrix	0	0	0	0	0	17	0
Zoöglœa	3	3	1	5	2	3	3
Total	7	3	50	193	50	83	81

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1905.	January 13.	March 15.	May 11.	May 16.	July 18.	September 15.	November 17.
Number of Sample . .	52681	53226	54107	54193	53135	56756	58179
Plants.							
DIATOMACEÆ:	2	0	708	212	202	51	16
Asterionella	0	0	76	50	6	0	0
Cyclotella	0	0	0	0	192	5	6
Synedra	0	0	580	50	0	20	10
Tabellaria	0	0	48	112	4	16	0
CYANOPHYCEÆ:	0	0	0	0	0	3	0
Anabæna	0	0	0	0	0	2	0
ALGÆ:	0	1	0	16	0	21	4
Animals.							
INFUSORIA:	20	0	4	4	1	121	0
Cryptomonas	0	0	0	0	0	11	0
Dinobryon	11	0	0	0	0	91	0
VERMES:	0	0	0	0	0	3	1
CRUSTACEA: (Cyclops)	0	0	0	.02	0	0	0
MISCELLANEOUS, Zoöglœa	3	1	5	3	3	5	4
Total	25	2	717	235	206	204	25

Microscopical Examination of Water from [illegible] River at [illegible]

Number of Organisms per Cubic Centimeter.

Date of Examination. 189[illegible]	March [illegible]	April [illegible]	May [illegible]	May [illegible]	September [illegible]	November [illegible]	January [illegible]
Number of Sample . .	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Plants.							
DIATOMACEÆ:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CYANOPHYCEÆ:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ALGÆ: (Raphidium)	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]
Animals.							
INFUSORIA:	5	45	0	1	1	1	0
Dinobryon	0	10	0	0	0	0	1
VERMES:	0	3	0	0	0	0	1
CRUSTACEA:	0	0	0	0	0	0	0
MISCELLANEOUS,							
Crenothrix	8	0	0	1	41	[illegible]	4
Zooglœa	5	3	1	[illegible]	1	[illegible]	1
Total	24	48	16	8	30	7	11

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1905.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	173,422,191	5,594,264	. . . . .	273,347	66.99	410.91
February	171,199,709	6,114,275	. . . . .	61,571	73.22	449.11
March	160,265,509	5,169,855	. . . . .	438,610	61.91	379.74
April	140,155,329	4,671,844	. . . . .	71,021	55.95	343.16
May	153,727,683	4,958,957	33,845	. . . . .	59.38	364.25
June	140,364,772	4,678,826	. . . . .	581,585	56.03	343.67
July	158,952,849	5,127,511	. . . . .	385,545	61.40	376.63
August	149,474,102	4,821,745	. . . . .	782,568	57.74	354.17
September	140,431,333	4,681,044	. . . . .	620,502	56.06	343.84
October	145,284,056	4,686,582	. . . . .	227,829	56.12	344.24
November	129,755,980	4,325,199	. . . . .	498,534	51.79	317.70
December	134,065,942	4,324,708	. . . . .	953,713	51.79	317.66
Totals and averages . .	1,797,099,455	4,923,560	. . . . .	424,436	59.03	362.09

Basis: Population, Lynn and Saugus, 83,500.

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
January	[illegible]		
February	[illegible]	[illegible]	
March	[illegible]	[illegible]	
April	[illegible]	[illegible]	
May		[illegible]	
June		[illegible]	
July	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]
[illegible]		[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

TABLE III.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1905

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	. .	. .	. .	. .	. .	.01	. .	. .	. .	. .
2	.31	. .	. .	. .	. .	. .	.13	.25	.49	.05	. .	.05
3	*.40	. .	. .	. .	. .	.05	. .	. .	2.34	. .	. .	.94
4	*.01	. .	. .	.24	. .	. .	. .	. .	.28	. .	.84	. .
5	. .	. .	. .	1.19	. .	. .	. .	. .	.02	. .	.01	. .
6	1.29	*.52	. .	. .	.07	.15	. .	. .	.29	. .	. .	. .
7	. .	. .	. .	. .	. .	.53	. .	. .	. .	. .	.26	. .
8	. .	. .	.87	. .	.06	. .	. .	. .	. .	. .	.03	. .
9	. .	.34	.38	. .	. .	. .	. .	.37	. .	. .	. .	. .
10	. .	. .	. .	.37	. .	. .	. .	. .	. .	. .	. .	.45
11	. .	. .	. .	.11	. .	.04	. .	. .	.27	.08	. .	.05
12	.38	.45	. .	. .	. .	.69	. .	.20	.14	. .	. .	. .
13	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
14	. .	. .	. .	. .	.06	. .	.29	. .	. .	. .	. .	. .
15	. .	. .	. .	. .	.09	. .	. .	.47	. .	. .	. .	. .
16	. .	. .	. .	. .	.12	. .	. .	.05	. .	. .	.05	. .
17	. .	. .	. .	. .	.32	.10	. .	. .	. .	. .	. .	. .
18	. .	. .	. .	. .	.28	.15	. .	. .	. .	. .	. .	. .
19	.	. .	.18	. .	. .	1.49	. .	. .	.18	.03	. .	. .
20	. .	. .	*.65	. .	. .	. .	. .	. .	. .	.34	. .	.18
21	. .	. .	. .	.51	. .	1.14	. .	. .	.13	. .	. .	.82
22	*.01	. .	. .	. .	. .	.30	. .	. .	. .	. .	. .	. .
23	.	.	. .	. .	. .	. .	. .	. .	. .	. .	. .	.14
24	.01	. .	. .	. .	. .	. .	. .	.11	. .	. .	. .	. .
25	.03	. .	.09	. .	. .	.18	. .	. .	. .	. .	. .	. .
26	. .	. .	. .	. .	. .	.01	. .	. .	. .	. .	. .	. .
27	. .	.	. .	. .	.15	.20	. .	.16	. .	. .	. .	. .
28	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.32	.41
29	. .	. .	. .	.02	.06	. .	.06	07	. .	. .	.53	. .
30	. .	. .	. .	. .	. .	. .	. .	.35	. .	. .	. .	. .
31	. .	. .	. .	. .	. .	. .	28	. .	. .	. .	. .	.01
Total	2.44	1.31	2.17	2.44	1.21	5.03	.76	2.04	4.14	.50	2.04	3.05

* Snow.

Total for the year 27.13.

Gallons
18
17
16
15
14
13
12
11.

TABLE IV.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1905.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	. .	. .	. .	. .	. .	.03	. .	. .	. .	. .
2	0.30	. .	. .	. .	. .	.05	.15	.31	.71	.07	. .	.04
3	*1.17	. .	. .	. .	. .	. .	. .	. .	4.00	. .	.93	.93
4	*0 18	. .	*.03	.22	. .	. .	. .	. .	.39	. .	.11	. .
5	. .	*.15	. .	1.15	.02	.04	. .	. .	.03	. .	.02	. .
6	.92	*.35	. .	. .	.04	.20	. .	. .	.20	. .	.22	. .
7	.08	*.02	.35	. .	. .	.52	. .	. .	. .	. .	.04	. .
8	. .	. .	.60	. .	.10	. .	. .	. .	. .	. .	. .	. .
9	. .	*.34	.36	. .	. .	. .	. .	.40	. .	. .	. .	*.70
10	. .	. .	. .	.35	. .	. .	.02	.02	. .	. .	. .	*.27
11	*.08	. .	. .	.16	. .	.07	. .	.10	.29	.15	. .	. .
12	.42	*.25	. .	. .	. .	.75	. .	.20	.18	. .	. .	. .
13	. .	*.03	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
14	. .	. .	. .	.04	.12	. .	.40	. .	. .	. .	. .	. .
15	. .	. .	. .	. .	.11	. .	. .	.65	. .	. .	.05	. .
16	. .	. .	. .	. .	.19	. .	.02	.20	. .	. .	. .	. .
17	. .	. .	. .	. .	.35	.11	. .	. .	. .	. .	. .	. .
18	. .	. .	. .	. .	.33	.19	. .	. .	.22	.04	. .	. .
19	. .	. .	.20	. .	. .	.25	. .	. .	.04	.60	. .	. .
20	. .	*.04	. .	. .	. .	.02	. .	. .	.14	.27	. .	.23
21	*.04	. .	*.84	.55	. .	1.35	. .	. .	. .	. .	. .	.80
22	*.07	. .	. .	.05	. .	.30	. .	. .	. .	. .	. .	.03
23	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.13
24	*.31	. .	.05	. .	. .	. .	. .	.22	. .	. .	. .	. .
25	*.90	. .	.14	. .	. .	.24	. .	. .	. .	. .	. .	. .
26	. .	. .	.02	. .	.02	.03	.02	. .	. .	. .	. .	. .
27	. .	. .	. .	. .	.26	.21	. .	. .	. .	. .	. .	. .
28	*.04	. .	. .	. .	. .	. .	. .	.11	. .	. .	.25	.36
29	. .	. .	. .	.03	.07	. .	.08	. .	. .	. .	.47	.12
30	. .	. .	. .	. .	. .	. .	.06	.42	. .	. .	. .	. .
31	. .	. .	. .	. .	. .	. .	.37	.04	. .	. .	. .	* 03
Total	4.51	1.18	2.59	2.55	1.61	5 33	1.12	2.70	6.20	1.13	2 09	3.70

*Snow.

Total for the year, 34.71.

TABLE IV.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1905

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	. .	. .	. .	. .	. .	.03	. .	. .	. .	. .
2	0.30	. .	. .	. .	. .	.05	.15	.31	.71	.07	. .	.04
3	*1.17	. .	. .	. .	. .	. .	. .	. .	4.00	. .	.03	.03
4	*0 18	. .	*.03	.22	. .	. .	. .	. .	.39	. .	.11	. .
5	. .	*.15	. .	1.15	.02	.04	. .	. .	.03	. .	.02	. .
6	.02	*.35	. .	. .	.04	.20	. .	. .	.20	. .	.22	. .
7	.08	*.02	.35	. .	. .	.52	. .	. .	. .	. .	.04	. .
8	. .	. .	.60	. .	.10	.	. .	. .	. .	. .	. .	. .
9	. .	* 34	.36	. .	. .	. .	. .	.40		. .	. .	*.70
10	. .	. .	.	.35	. .	. .	.02	.02		. .	. .	*.27
11	*.08	. .	. .	.16	. .	.07	. .	.10	.29	.15	. .	. .
12	.42	*.25	. .	. .	. .	.75	. .	.20	.18	. .	. .	. .
13	. .	*.03	. .	. .	. .	. .	. .	. .		. .	. .	. .
14	. .	. .	. .	.04	.12	. .	.40	. .		. .	. .	. .
15	. .	. .	. .	. .	.11	. .	. .	.65		. .	.05	. .
16	. .	. .	. .	. .	.19	. .	.02	.20		. .	. .	. .
17	. .	. .	. .	. .	.35	.11	. .	. .		. .	. .	. .
18	. .	. .	. .	. .	.33	.19	. .	. .	.22	.04	. .	. .
19	. .	. .	.20	. .	. .	.25	. .	. .	.04	.60	. .	. .
20	. .	*.04	. .	. .	. .	.02	. .	. .	.14	.27	. .	.23
21	*.04	. .	*.84	55	. .	1.35	. .	. .	. .	. .	. .	.80
22	*.07	. .	. .	.05	. .	.30	. .	. .	. .	. .	. .	.03
23	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.13
24	*.31	. .	.05	. .	. .	. .	. .	.22	. .	. .	. .	. .
25	*.50	. .	.14	. .	. .	.24	. .	. .	. .	. .	. .	. .
26	. .	. .	.02	. .	.02	.03	.02	. .	. .	. .	. .	. .
27	. .	. .	. .	. .	.26	.21	. .	. .	. .	. .	. .	. .
28	*.04	. .	. .	. .	. .	. .	. .	.11	. .	. .	.25	.30
29	. .	. .	. .	.03	.07	. .	.08	. .	. .	. .	.47	.12
30	. .	. .	. .	. .	. .	. .	.06	.42	. .	. .	. .	. .
31	. .	. .	. .	. .	. .	. .	.37	.04	. .	. .	. .	* 03
Total	4.51	1.18	2.59	2.55	1.61	5 33	1.12	2.70	6.20	1.13	2 09	3.70

*Snow.

Total for the year, 34.71.

TABLE V.

SHOWING THE DEPTH OF WATER IN PONDS FOR EACH WEEK DURING 1905.

DATE.	FEET.				
	Hawkes Pond.	Breed's Pond.	Birch Pond.	Walden Pond.	Glen Lewis Pond.
January 3	8-7	19-7	8-10	5-2	. . .
January 10	9-2	20-2	8-10	7-5	. . .
January 16	9-8	20-1	8-10	8-0	. . .
January 23	9-8	19-7′	8-10	8-5	. . .
January 30	8-9	18-10	8-11	8-8	. . .
February 6	7-4	17-9	8-8	8-9	. . .
February 14	6-4	17-0	8-10	8-10	. . .
February 20	4-6	16-0	7-10	8-11	. . .
February 28	. . .	12-10	6-4	6-5	. . .
March 7	. . .	10-9	7-0	4-9	. . .
March 13	6-0	9-10	6-4	6-8	. . .
March 22	13-0	11-3	9-6	9-10	. . .
March 30	17-2	10-9	10-1	11-4	7-0
April 6	23-9	11-7	10-2	11-10	8-0
April 14	22-3	12-0	16-2	12-7	11-2
April 21	20-0	12-6	17-4	14-9	11-10
April 27	19-3	12-11	16-4	17-9	12-0
May 4	15-4	13-1	19-4	18-3	12-1
May 12	10-6	13-2	21-10	18-3	12-4
May 19	14-0	13-6	20-5	18-3	12-5
May 29	17-2	13-7	18-6	18-3	12-6
June 3	17-11	13-7	17-6	18-3	12-7
June 10	19-0	13-9	17-4	17-5	12-8
June 16	20-1	14-0	19-6	15-6	12-10
June 22	16-0	14-5	18-11	18-2	13-1
July 1	14-8	14-10	21-2	18-6	13-8
July 8	17-0	14-10	21-4	17-6	13-11
July 13	17-8	14-10	20-4	17-6	14-0
July 21	18-1	14-10	19-0	17-5	14-0
July 28	18-3	14-8	17-0	17-2	13-9
August 4	18-6	14-6	15-8	17-1	13-9
August 10	18-8	14-6	17-3	15-1	13-8
August 17	18-10	14-8	19-5	12-10	13-10
August 25	19-0	14-7	20-2	10-10	13-10
September 1	19-0	14-7	20-3	9-8	13-10
September 7	22-3	15-8	20-4	10-2	15-0
September 13	22-7	16-6	19-8	9-9	15-4
September 23	22-10	16-6	18-6	9-10	15-5
September 30	23-0	16-6	16-9	9-11	15-6
October 7	22-11	16-1	16-8	9-0	15-6
October 16	22-9	15-10	16-8	8-0	15-6
October 23	18-4	15-4	15-0	11-1	15-6
October 29	12-11	14-11	14-2	14-1	15-5
November 4	11-10	14-6	14-3	14-6	15-9
November 11	15-5	14-4	13-3	14-9	15-11
November 20	16-11	14-4	12-9	14-2	16-0
November 25	18-1	14-4	14-2	12-5	16-0
December 1	19-3	14-6	14-7	13-6	7-10
December 9	20-6	14-0	16-3	13-6	7-0
December 19	21-6	14-0	16-0	13-6	7-0
December 26	23-0	14-5	17-1	12-8	6-0
December 29	23-3	14-6	18-0	12-8	4-0

TABLE VI.

SHOWING THE LOCATION OF GATES SET IN [illegible]

STREET	LOCATION
Boulevard, King's R.	[illegible] feet east of [illegible], [illegible] feet [illegible] inches south of the north line of boulevard
Boulevard, King's R.	1 foot 11 inches south of the north line of the boulevard, [illegible] feet 8 in. west of east line of King street
Boulevard, King's R.	30 feet 4 in. east of west line of Ocean street, 6 ft. 8 in. south of Div. line between Nos. [illegible] and [illegible]
Beaudry place	On east line of Lawton avenue, 12 feet south of north side of Beaudry place
Brown court	On south line of Boston street, 11 feet west of east side of Brown's court
Canal	On north-west line of River street, 9 feet 4 inches from north side of Canal street
Chatham	On line with south side of Bloomfield street, 10 feet 4 inches east of west line of Chatham street
Commercial	2 feet 3 inches south of south line of [illegible] street, 16 ft. 3 in. west of east line of Commercial street
Dineen place	On north line of Boston street, 4 feet 8 inches west of east of Dineen place
Essex avenue	On north line of Williams avenue, 9 feet 3 inches east of west line of Essex avenue
Ezra	On line with west side of Mather street, 13 feet 9 inches north of south side of Ezra street
Greystone park	2 ft. 2 in. north of north line of boulevard, 11 feet 6 inches west of east line of Greystone park
Hunnewell place	On line with east side of [illegible] street, 5 feet 3 inches north from south side of Hunnewell place

TABLE VI.—*Continued.*

STREET.	LOCATION.
King	1 foot 3 inches north of north line of boulevard. 5 feet 3 inches west of east line of King street.
King's Beach terrace.	2 feet 2 inches north of north line of boulevard. 13 feet 2 in. west of east line of King's Beach ter.
Lawton avenue	On line of south side of Rogers avenue, 16 feet east of west line of Lawton avenue.
Lexington court	On line of north line of Lexington street, 10 feet west of east line of Lexington court.
Mailey	On line with north side of Ezra street, 16 feet 4 inches west of east line of Mailey street.
Maple	On line with west side of Lake avenue, 14 feet 8 inches south of north line of Maple street.
Ocean terrace.......	2 feet 2 inches north of north line of boulevard, 10 feet 10 inches west of east line of Ocean terrace.
Pond...............	6 inches south of north line of Bowler street, 16 feet 6 inches east of west line of Pond street.
Prescott place.......	2 feet 6 inches north of north line of boulevard, 14 feet west of east line of Prescott place.
River	On line of west side of Ida street, 14 feet south of north side of River street.
Windmere terrace...	On the east line of Estes street, 4 feet 6 inches south of north line of Windmere terrace.
Wolcott road	1 foot 5 inches north of north line of boulevard, 21 feet 7 inches west of east line of Wolcott road.

TABLE VII.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	Total
Trident	751	814	96	5	6	. . .	. . .	1,672
Thomson	140	336	51	18	3	1	1	550
Lambert	644	640	95	11	20	. . .	. . .	1,410
Hersey	81	64	11	. . .	1	. . .	. . .	147
Ball and Fitts	26	20	14	. . .	. . .	. . .	. . .	60
Union	4	21	3	8	7	. . .	9	52
Nash	40	14	1	. . .	1	. . .	. . .	65
Niagara	30	27	1	. . .	. . .	. . .	. . .	58
Columbia	44	7	. . .	. . .	. . .	. . .	. . .	51
Crown	1	7	1	1	. . .	. . .	. . .	10
Empire	11	11	3	3	4	1	1	34
All others	4	8	3	3	. . .	2	. . .	20
Motors	4	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Totals	1,791	1,078	260	43	42	4	11	4,138

TABLE VIII.

SHOWING CONSUMPTION IN GALLONS OF ESTIMATED AND METERED QUANTITIES.

Domestic, non-metered		899,415,000
Manufacturing, metered		390,000,000
Domestic, metered		205,000,000
Loss in registration, 5 per cent. estimated		2,975,000
Loss in distribution, 10 per cent. estimated pumpage		179,710,000
CITY PURPOSES.		
Street sprinkling	50,000,000	
Watering troughs	33,000,000	
Schools	17,000,000	
Fires	5,000,000	
Sewers	3,000,000	
Highway Department	3,000,000	
Engine houses	2,000,000	
Fountains	2,000,000	
City Hall	1,000,000	
Police Station	1,000,000	
Health Department	1,000,000	
Cemeteries	500,000	
Public Library	500,000	
Water Department	500,000	
All others	500,000	
		120,000,000
Total		1,797,100,000

TABLE IX.

SHOWING TOTAL LENGTH AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS.

	6 in.	2 in.	1½ in.	1 in.	¾ in.	½ in.	Total.
Lynn	207	864	1,225	9,248	4,821	171	16,536
Saugus	246	93	....	819	1,952	....	3,110
Total	453	957	1,225	10,067	6,773	171	19,646

TABLE X.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1905.

WHERE LAID.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	Total.
Boulevard K. B.	. . .	. . .	. . .	. . .	2,807	. . .	2,807
Bowler* . .	. . .	. . .	. . .	. . .	750	. . .	750
Camden* . .	. . .	. . .	. . .	. . .	52	. . .	52
Chatham* . .	. . .	. . .	. . .	. . .	600	. . .	600
Commercial* .	. . .	. . .	. . .	1,577	984	. . .	2,561
City Hall Sq* .	. . .	250	. . .	. . .	48	. . .	298
Elm* . . .	1,140	. . .	. . .	. . .	. . .	. . .	1,140
Ezra* . . .	. . .	. . .	. . .	. . .	203	. . .	203
Herbert* . .	. . .	. . .	. . .	. . .	338	. . .	338
Herschel† . .	. . .	. . .	. . .	. . .	441	. . .	441
Hollingsworth* .	. . .	. . .	. . .	. . .	401	. . .	401
Ida* . . .	. . .	. . .	. . .	. . .	850	. . .	850
King† . . .	. . .	. . .	. . .	. . .	. . .	38	38
Lake avenue* .	. . .	. . .	. . .	. . .	410	. . .	410
Lawton avenue* .	. . .	. . .	. . .	. . .	755	. . .	755
Mailey* . .	. . .	. . .	. . .	. . .	452	. . .	452
Maple* . .	. . .	. . .	. . .	1,843	. . .	. . .	1,843
No. Common* .	. . .	. . .	853	. . .	. . .	. .	853
Pinkham* . .	. . .	. . .	. . .	. . .	438	. .	438
Pitkin† . . .	. . .	. . .	10	. . .	. . .	. . .	10
Pond* . . .	. . .	. . .	. . .	. . .	701	. . .	701
River* . . .	. . .	. . .	. . .	. . .	505	. . .	505
South* . . .	. . .	. . .	. . .	. . .	702	. . .	702
Summer* . .	583	. . .	. . .	. . .	. . .	. .	583
Tracy avenue† .	. . .	. . .	. . .	. . .	96	. . .	96
Wolcott road† .	. . .	. . .	. . .	. . .	. . .	50	50
Williams Ave.* .	. . .	. . .	. . .	. . .	770	. . .	770
	1,723	250	863	3,420	12,714	88	19,058

	MILES.	FEET.
*Total length relaid	2	1,096
†Total length extended		915
Total length new		2,907
Total length system	118	927
Total in Swampscott		1,788
Total in Saugus	10	200

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1905.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population by census of 1905,	
Lynn,	77,000
Saugus,	6,250
Date of construction,	1873
Owned by	City of Lynn
Source of supply,	Artificial ponds and river
Mode of supply,	Pumping to reservoir

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
    - *a.* Kind, soft.
    - *b.* Brand of coal used, Georges Creek.
    - *c.* Average price of coal per gross ton, delivered, $4.75.
    - *d.* Percentage of ash, 10.93.
    - *e.* Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
598,300	1,966,800	2,700

Auxiliary

2,700

639,400

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ASTOR, LENOX AND TILDEN FOUNDATIONS.

236 8

Leavitt,
94,965,718

:XPENSES

$9.00

$.058

In form

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

Populati
Lynn
Saugu
Date of

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Source o

Mode of

1. Bui

2. Des

3. Coa

		[illegible]	[illegible]	[illegible]
4.	Pounds of wood consumed ÷ 3 = equivalent amount of coal, pounds.			
4a.	Amount of other fuel used.			
5.	Total equivalent coal consumed for the year = 3 + 4 + 4a, in pounds.	[illegible]	[illegible]	[illegible]
6.	Total pumpage for the year, in gallons, with allowance for slip.	[illegible]	[illegible]	[illegible]
7.	Average static head against which pumps work, in feet.	[illegible]	[illegible]	
8.	Average dynamic head against which pumps work, in feet.	[illegible]	[illegible]	
9.	Number of gallons pumped per pound of equivalent coal (5).	[illegible]	[illegible]	[illegible]

10. Duty = $\frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5)}}$

[illegible] [illegible]

[illegible] [illegible]

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES, VIZ., $10,307.11.

11.	Per million gallons pumped,	[illegible]
12.	Per million gallons raised one foot (dynamic),	[illegible]

FINANCIAL STATISTICS.

RECEIPTS.		
(*a*) From ordinary (maintenance) receipts,		$239,957.40
(*b*) From extraordinary receipts (bonds, etc.),		70,858.73
Total,		$310,816.13
From Water Rates:		
A. Fixture rates,	$114,273.30	
B. Meter rates,	116,764.65	
C. Total from consumers,		$231,037.95
L. From bond issue,		60,000.00
M. From other sources,		19,778.18
N. Total,		$310,816.13

EXPENDITURES.		
Water Works Maintenance:		
AA. Operation (management and repairs),	$116,666.15	
CC. Total maintenance,		$116,666.15
DD. Interest on bonds,		77,291.25
FF. Sinking Fund,		46,000.00
Water Works Construction:		
HH. Extension of services,	$2,407.69	
JJ. Increased storage,	65,975.64	
KK. Total construction		68,383.33
Total balance,		2,475.40
N. Total,		$310,816.13

DISPOSITION OF BALANCE, TO CONSTRUCTION, 1906.

O.	Net cost of works to date, ...	$2,965,703.53
P.	Bonded debt at date, ...	1,798,500.00
Q.	Value of Sinking Fund at date, ...	386,008.14
R.	Average rate of interest, .03¾ per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1. Estimated population at date,	83,500
2. Estimated population on lines of pipe,	82,500
3. Estimated population supplied,	82,500
4. Total consumption for the year (gallons),	1,799,167,275
5. Passed through meters (gallons),	595,000,000
6. Percentage of consumption metered,	32¼ per cent.
7. Average daily consumption in gallons,	4,923,560
8. Gallons per day to each inhabitant,	59.00
9. Gallons per day to each consumer,	60.00
10. Gallons per day to each tap,	362
11. Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$48.00
12. Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$100.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1. Kind of pipe,	Cement-lined, and cast-iron.
2. Sizes,	From 36 to 4 inch
3. Extended during year (feet),	635

4. Discontinued during year (feet),	None.
5. Total now in use (miles),	138
6. Cost of repairs per mile,	$136.00
7. Number of leaks per mile,	.082
8. Length of pipes less than 4 inches diameter (miles),	
9. Number of hydrants added during year (public and private),	4
10. Number of hydrants (public and private), now in use,	972
11. Number of stop gates added during year,	25
12. Number of stop gates now in use,	1,044
13. Number of stop gates smaller than 4-inch,	
14. Number of blow-offs,	67
15. Range of pressure on mains (pounds),	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	19,646
19. Discontinued (feet),	420
20. Total now in use (miles),	105
21. Number of service taps added during year,	370
22. Number now in use,	13,556
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	406

26. Number now in use.

27. Percentage of services metered. [illegible]

28. Percentage of receipts from meters, water [illegible] [illegible]

29. Number of motors and elevators added. [illegible]

30. Number now in use.

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1906.

Compliments of

[illegible]

John F. McCarty & Co., Printers
1907

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1906

LYNN, MASS.
John F. McCarty & Co., Printers
1907

OFFICERS FOR 1906.

S. W. DEARBORN	JAMES BURNS
C. E. SPRAGUE	THOMAS P. NICHOLS

WILLIAM B. LITTLEFIELD, *Pres.*

Superintendent and Clerk, D. A. SUTHERLAND.
Water Registrar, WALLACE O. MUDGE.
Pumping Engineer, C. A. COWLES.
Assistant Engineer, GEORGE H. VENN.
Foreman of Mains, EDWIN MAXWELL.
Foreman of Services, HENRY WHEELOCK.
Foreman of Meters and Repairs, W. H. MCCLAIN.

INSPECTORS.

WINSLOW J. ROWELL	W. B. MOULTON
J. FRANK POOL	JOHN CHAMBERLAIN

CLERKS.

MABEL R. BUTLER	HELENE C. PINKHAM

ANNUAL REPORT

To the Honorable the Mayor and City Council:

GENTLEMEN:—The Public Water Board, in accordance with the requirements of the City Charter and Ordinances, have the honor of submitting this thirty-fifth annual report of the Water Department of the City of Lynn. In March a vacancy was made in the Board, caused by the death of Charles E. Sprague. Mr. Sprague had been a member of the Public Water Board since 1900. He was highly esteemed by his associate members, who sincerely regretted the loss of a valuable member. The President called a special meeting of the Water Board, March 26, 1906, at which the following resolutions were adopted:

"Whereas, Our associate member, Charles E. Sprague, has been removed from our Board by his sudden demise, we, therefore, deem it fitting and proper to pause in our deliberations and pay tribute to his memory and worth; therefore be it

"Resolved, That the Board loses a true friend, a wise counselor and a worthy member, whose judgment and wisdom have been not only of value to us, but to the city.

"Our long associations have bound us together with ties of sincere friendship and the separation has afflicted us with profound sorrow and regret. We shall miss his familiar voice and presence, but we must bow to the dispensation of our 'Heavenly Father,' and may the pleasant recollections of his memory remind us that he has only gone before us and that some day we shall again see him.

"Be it further

"Resolved, That we extend to the widow and family of our deceased Brother our sincere sympathy in their sad hour of affliction and bereavement. That these resolutions be spread upon the records and a copy of the same be forwarded to the family."

The City Council in concurrence elected Eugene A. Bessom to fill the vacancy, and Mr. Bessom qualified and became a member of the Board April 25th.

During the year the Walden Pond Reservoir has been completed by the erection of a small dam at the Wyoma end of the pond. As will be seen from the Superintendent's Report, this dam was constructed in a thorough manner within the appropriation. A considerable amount of work has been done on all of the water-sheds, in cleaning the brooks tributary to the several reservoirs, and we expect the coming year the value of this work will be manifest in the improved quality of the water. Much more may be done in this direction and in the opinion of the Board should be supplemented by acquiring by lease or purchase strips of land three or five hundred feet wide adjacent to all of the principal water courses that contribute to our water supply.

There are at this time about twenty miles of cement-lined pipe in our system of distribution. Some of this pipe is fairly good, but much of it is in very poor condition and in the very near future must be renewed by new pipe. Heretofore such renewals have been charged to maintenance; in future the difference in cost of larger mains, in our opinion, should be charged to construction.

We have the present year in addition to relaying two miles, 2.964 feet laid on extensions, 529 feet on new streets, and in conduit 1404 feet: this includes 100 feet of 48-inch main in open conduit between Hawkes Pond and Birch Pond. The following year it will be advisable to increase the amount of work of this description materially.

The Legislature of 1906 reported the following Act relative to our water supply:

ACT.

Section 1. The State board of health and the water board of the city of Lynn are hereby authorized and directed to investigate, consider and report upon, the matter of enlarging and improving the water supply of the city of Lynn, including all question relating to the quantity of water to be obtained from available sources, its quality, the best methods of improving its quality and protecting its purity, by filtration or otherwise, the cost of construction, operation and maintenance of works for storing, conveying or purifying the water, damages to property, and all other matters pertaining to the subject.

Section 2. Said board shall have power to employ such engineering and other assistance and to incur such expenses as may be necessary in carrying out the provisions of this act.

Section 3. The said Board shall report the said plans and estimates to the general court on or before the first Thursday in January in the year nineteen hundred and seven, and shall append to its report drafts of any bills which it may deem suitable to carry out its recommendations.

Section 4. The chairman of the State board of health shall be the chairman of the joint board.

Section 5. The total amount of money expended from the treasury of the Commonwealth in carrying out the provisions of this act shall not exceed two thousand dollars, and the amount so expended shall be repaid to the Commonwealth by the city of Lynn.

Section 6. This act shall take effect upon its passage.

In accordance with this Act, the State board of health and the public water board of Lynn met at the State House, August 2nd, for the purpose of organization. Mr. X. H. Goodnough and Mr. G. I. Leland were chosen engineers to make surveys and plans. Mr. Goodnough was chosen secretary. The joint board have not held any further meetings, but the engineers have pursued their investigations and will report to the board when their work is completed.

Early in the year the board appropriated $1031.47 for the extermination of the gypsy moth. This work was done under the supervision of the water board. Later, at the suggestion of His Honor the Mayor and by authority conferred by the City Council, the board made an appropriation of five thousand dollars; this work was done under direction of the Board of Public Works; $4176.14 of this amount has been expended, leaving $823.86 for the work in 1907.

In October, four members of the board retired, leaving Mr. Bessom sole member of the board. Up to the present time the City Council have not filled the vacancies.

An examination of the financial statement of the registrar shows that the water department has made a gratifying and substantial increase of business over the preceding year; the net receipts exceeding those of 1905 by eighteen thousand dollars, the net revenue for the year being sixty-four thousand dollars. This amount would have been somewhat larger if the financial year had not been changed to conform to the fiscal year of the other departments.

A full knowledge of the work in detail for the year may be acquired by a careful reading of the reports of the registrar and superintendent.

TREASURER'S STATEMENT.

Water Debt.

Amount of debt, December 19, 1905	$1,798,500 00	
Bonds matured and paid in 1906	10,000 00	
Amount of debt, December 19, 1906		$1,788,500 00

Sinking Funds.

Amount of funds, December 19, 1905	$340,008 14	
Received from City Treasurer in 1906	46,000 00	
Earnings of sinking funds in 1906	13,254 22	
	$399,262 36	
Deduct bonds paid within the year	10,000 00	
	$389,262.36	
Amount in hands of City Treasurer, December 19, 1906	64,000 00	
		$453,262 36
Net total debt		$1,335,237 64

Water Maintenance.

Receipts.

From water rates	$256,060 49	
Transfer from Water Construction, Increased Storage	14 76	
		$256,075 25

Expenditures.

For Maintenance	$123,335 25	
For Interest	68,740 00	
		$192,075 25
Net income for year ending December 19, 1906		$64,000 00

EUGENE A. BESSOM,
Acting President.

REPORT OF THE WATER REGISTRAR.

To Hon. Eugene A. Bessom:

Sir:—I herewith present the financial condition of the department for the year ending December 19, 1906.

Receipts.

Meter rates	$130,702 29	
Fixture rates	111,943 38	
Miscellaneous	10,977 12	
Additional rates	1,740 91	
Fines	48 00	
Total maintenance		$255,411 70
Construction		3,680 61
Total receipts as per cash book		259,092 31
To which add amount paid the City Treasurer, December 23, 29, 30, '05,		1,303 88
Total as per auditor's statement		$260,396 19

The financial statement has always been made on calendar years, so in order to conform to the Treasurer's and Auditor's Statement, the account is changed accordingly.

Receipts for 1906 Maintenance	$256,075 25

Expenses.

Maintenance .	$117,[illegible]	
Interest . . .	65,740 00	
Rebate to Saugus . .	5,945 47	
		$189,075 95
Surplus		$64,000 00

MAINTENANCE ACCOUNT.

Comparative Statement of Revenue.

Amount collected		$255,411 70
Amount outstanding fixture rates .	$24,227 23	
Amount outstanding meter rates . .	9,787 91	
Amount outstanding miscellaneous .	1,818 98	
		35,839 19
Amount outstanding meter assessment for quarter ending December 31, 1906		96,970 38
		$310,814 90
Deduct amount due January 1, 1906 .		51,088 10
Revenue for 1906		$259,886 80
Revenue for 1905		$240,476 79
Increase		$18,779 77

Construction Account.

Amount outstanding	$4,660 87

EXPENDITURES.

Maintenance.

Mains	$31,409 23	
Services	18,908 29	
Pumping expenses, Walnut street	13,208 61	
Salaries and office expenses	9,497 21	
Meters	8,412 42	
Stable and shop	5,038 88	
Moth Extermination (special)	4,176 14	
Pumping expenses, Walden Pond	3,206 88	
Engine House, Walnut street	2,293 22	
Engines and boilers, Walnut street	2,071 94	
Ipswich River (rights)	2,000 00	
Gate House, Walden Pond	1,510 90	
System	1,111 00	
Walden Pond	1,033 50	
Moth Extermination	1,031 47	
Special Commission	1,000 00	
Conduit Hawkes Canal	914 22	
Miscellaneous expenses	822 49	
Hawkes Pond	814 53	
Damages	669 10	
Birch Pond	667 53	
Penny Brook	629 89	
Filtration Expert	479 37	
Reservoir	372 64	
Town of Saugus Tax	354 78	
Care of roads	216 00	
Town of Lynnfield Tax	151 57	
Glen Lewis Pond drain	139 82	
		$112,141 63
Add amount of 1905 account to conform to auditor	5,248 15	
		117,389 78

Construction

Services	[illegible]	
Walden Pond dike	[illegible]	
Land	[illegible]	
Meters	[illegible]	
		[illegible]
Less amount received for pipe		[illegible]
Net		[illegible]

STATEMENT.

Showing Cost of Works to January 1, 1907.

Mains, hydrants and gates	$883,404 99
Walden and Glen Lewis Ponds	504,220 07
New supply and land	338,970 92
Services and courts	337,885 20
Engines and boilers	140,327 29
Hawkes Pond	161,036 53
Reservoirs and land	131,581 49
Birch Pond and land	93,471 84
Engine house, pump and conduit, Walden Pond	83,003 72
Engine house and land	57,562 39
Breed's Pond and land	57,135 28
Pipe conduits and land	81,289 39
Hawkes Pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
Highland service	12,431 17
Engineering	11,157 95
Tubular wells	9,470 02
Workshop and stable	2,056 97
Compressor	515 00
	$3,127,009 48
Less amount received for pipe	160,296 26
Total net cost	$2,966,713 22

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,
Water Registrar.

SERVICES

Number of services in [illegible]	[illegible]	
Number of services in [illegible]	[illegible]	
Total		[illegible]
Number put in during the year [illegible]	[illegible]	
Number put in during the year [illegible]	[illegible]	
Total		[illegible]
Number extended during the year [illegible]	[illegible]	
Number extended during the year [illegible]	[illegible]	
Total		[illegible]
Renewed	[illegible]	
Number discontinued	[illegible]	
Number not in use	[illegible]	
Turned on (new services)	[illegible]	
Turned on (re-occupied)	[illegible]	
Turned on (repairs)	[illegible]	
Shut off (for vacancy)	[illegible]	
Shut off (for non-payment)	[illegible]	
Shut off (for repairs)	[illegible]	

STATEMENT.

Showing the Number of Buildings to Which Water is Supplied, Also the Number of Families, Various Fixtures, Etc., Contained in the Same, Together with the Number of Fire Hydrants, December 31, 1906.

	Lynn	Saugus	Total
Dwellings	12,525	1,140	13,665
Stores and shops	1,261	50	1,311
Factories	220	4	224
Offices	524	17	541
Restaurants and saloons	81	..	81
School-houses	60	11	71
Churches	33	5	38
Bakeries	30	..	30
Laundries	21	..	21
Engine houses	12	3	15
Families	17,788	1,240	19,028
Boarding-houses	227	3	230
Faucets	33,067	2,069	35,136
Water-closets	15,526	600	16,126
Bath tubs	5,551	380	5,931
Hose bibs	3,270	200	3,470
Urinals	195	8	203
Heaters	364	80	444
Stationary engines	167	7	174
Motors	25	..	25
Greenhouses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	23	1	24
Stand-pipes for water-carts	80	..	80
Sewer connections	25	..	25
Automatic sprinklers	119	5	124
Hydrants	825	163	988
Hdyrants for car sprinklers	44	1	45

STATEMENT

Showing the Yearly Revenue of the Department Since the First Introduction of Water into the City in [illegible]

From October 1, 1871, to January 1, 1872	[illegible]
From January 1, 1872, to January 1, 1873	[illegible]
From January 1, 1873, to January 1, 1874	[illegible]
From January 1, 1874, to January 1, 1875	[illegible]
From January 1, 1875, to January 1, 1876	[illegible]
From January 1, 1876, to January 1, 1877	[illegible]
From January 1, 1877, to January 1, 1878	[illegible]
From January 1, 1878, to January 1, 1879	[illegible]
From January 1, 1879, to January 1, 1880	[illegible]
From January 1, 1880, to January 1, 1881	[illegible]
From January 1, 1881, to January 1, 1882	[illegible]
From January 1, 1882, to January 1, 1883	[illegible]
From January 1, 1883, to January 1, 1884	[illegible]
From January 1, 1884, to January 1, 1885	[illegible]
From January 1, 1885, to January 1, 1886	[illegible]
From January 1, 1886, to January 1, 1887	[illegible]
From January 1, 1887, to January 1, 1888	[illegible]
From January 1, 1888, to January 1, 1889	[illegible]
From January 1, 1889, to January 1, 1890	[illegible]
From January 1, 1890, to January 1, 1891	[illegible]
From January 1, 1891, to January 1, 1892	[illegible]
From January 1, 1892, to January 1, 1893	[illegible]
From January 1, 1893, to January 1, 1894	[illegible]
From January 1, 1894, to January 1, 1895	[illegible]
From January 1, 1895, to January 1, 1896	[illegible]
From January 1, 1896, to January 1, 1897	[illegible]
From January 1, 1897, to January 1, 1898	[illegible]
From January 1, 1898, to January 1, 1899	[illegible]
From January 1, 1899, to January 1, 1900	[illegible]
From January 1, 1900, to January 1, 1901	[illegible]
From January 1, 1901, to January 1, 1902	[illegible]
From January 1, 1902, to January 1, 1903	[illegible]
From January 1, 1903, to January 1, 1904	[illegible]
From January 1, 1904, to January 1, 1905	[illegible]
From January 1, 1905, to January 1, 1906	[illegible]
From January 1, 1906, to January 1, 1907	[illegible]
	[illegible]

FUNDED WATER LOAN.

When Payable.	Rate Per Cent.	Amount.
April 1, 1907	3½	$10,000
April 1, 1908	3½	10,000
April 1, 1909	3½	10,000
October 1, 1909	3½	100,000
April 1, 1910	3½	10,000
April 1, 1911	3½	10,000
November 1, 1913	4	20,000
November 1, 1914	3¾	31,000
March 15, 1915	4	50,000
December 1, 1914	4	20,000
December 1, 1915	3¾	6,000
April 1, 1916	3⅛	2,000
July 1, 1918	3½	24,500
June 1, 1918	4	10,000
April 1, 1918	4	9,000
November 1, 1917	3½	6,500
October 1, 1917	3½	3,500
August 1, 1917	4	7,500
July 1, 1917	4	5,000
June 1, 1917	4	2,000
February 1, 1917	4	6,500
October 1, 1916	4	15,000
September 1, 1916	4	10,000
May 1, 1916	4	50,000
April 1, 1916	4	100,000
July 1, 1919	4	110,000
January 1, 1920	4	35,000
April 1, 1920	4	150,000
April 1, 1921	4	50,000
October 1, 1921	4	25,000
January 1, 1922	4	50,000
July 1, 1922	4	25,000
April 1, 1923	4	40,000
July 1, 1925	4	165,000
July 1, 1926	4	50,000
September 1, 1927	4	25,000
July 1, 1928	4	25,000

When Payable.		Rate Per Cent.	Amount.
October	1, 1928	4	10,000
July	1, 1929	4	25,000
January	1, 1930	4	25,000
October	1, 1930	4	25,000
July	1, 1931	3½	25,000
January	1, 1932	3½	75,000
April	1, 1932	3½	325,000
			$1,788,500

REPORT OF SUPERINTENDENT.

To the Public Water Board:

In compliance with the city ordinance I herewith present my annual report for the year ending December 31, 1906. I have endeavored to be as concise as possible in giving a record of the work done by the department, in the following report and appending tables.

Water Supply.

We have taken our supply during the past year from the following ponds:

	Gallons	Gallons
Breed's	**449,079,834**	
Birch	**505,246,136**	
Walden	**790,006,776**	
Hawkes	**127,197,004**	
Total pumpage in 1906		**1,871,529,750**
Total pumpage in 1905		**1,799,167,275**
Increase in pumpage in 1906		**72,362,475**
Total consumption in 1906		**1,873,454,957**
Total consumption in 1905		**1,797,099,455**
Increase in consumption in 1906		**76,355,502**

The average consumption of water per day in 1906 was 5,132,753 gallons, which was an increase of 209,193 gallons per day more than in 1905.

Ponds.

Breed's Pond:—The bed and banks of the three brooks running into the pond have been cleaned and trenches dug to drain the meadows.

Walden Pond:—The shores of this pond have been cleared of underbrush and the surface burned over. The bed and banks of all brooks running into the pond have been cleaned and a dam about 11 feet high and 200 feet long has been built at the Wyoma end of the pond. An appropriation of $2500 was voted by the City Council for the work on the dam, but the work was completed for about $2000.

Hawkes Pond:—All the brooks running into Hawkes Pond have been cleaned their entire length. It is intended to continue this work until all of the brooks of the entire water-shed have been cleaned and all meadows drained. This will increase the quantity and improve the quality of the water received from these sources.

The dams in Saugus River and the canal at Montrose were badly decayed and have been rebuilt and new sluice gates installed.

The water in the Hawkes Pond canal at North Saugus percolated through the sides of the canal and caused some damage to property adjoining, consequently 160 feet of 48-inch pipe was laid in the bed of the canal, which will avoid any further trouble at this place and will also improve the service.

At the Walnut Street pumping station there has been a new floor laid in the engine room and at the shop and stable at the City Hall a new sill was put in and other necessary repairs made.

Following are the tables showing a detailed account of the work performed by the department.

New Court Pipes.

Drexel place from North Federal street, 158 feet of 2-inch galvanized iron pipe.

Graves avenue from Western avenue, 129 feet of 2-inch and 171 feet of 1½-inch galvanized iron pipe.

Court from No. 44 Lewis street, 91 feet of 1½-inch lead-lined pipe.

Court from No. 200 Lewis street, 139 feet of 1¼-inch lead-lined pipe.

Court from No. 210 Maple street, 111 feet of 2-inch galvanized iron pipe.

Court from No. 38 Michigan avenue, 116 feet of 2-inch galvanized iron pipe.

Revere avenue from Walnut street, 222 feet of 2-inch galvanized iron pipe.

Timsbury terrace from Ocean street, 155 feet of 2-inch galvanized iron pipe.

Washington place from Washington street, 218 feet of 2-inch galvanized iron pipe.

Court Pipes Extended.

Sluice road, 297 feet of 2-inch galvanized iron pipe.

Sutton street, 42 feet of 2-inch galvanized iron pipe.

New Main Pipe.

Echo Grove avenue from Summer street, 350 feet of 6-inch cast-iron pipe.

Raddin Grove avenue from Echo Grove avenue, 302 feet of 6-inch cast-iron pipe.

Verdmont avenue from Lynnfield street, 592 feet of 4-inch cast-iron pipe and 439 feet of 2-inch galvanized iron pipe.

Canal at Hawkes Pond, 160 feet of 48-inch pipe.

Main Pipe Extended.

Bailey street, 141 feet of 2-inch galvanized iron pipe.

Clark street, 161 feet of 6-inch cast-iron pipe.

Eastern avenue from Huron street north, 120 feet of 6-inch cast-iron pipe.

Hayes avenue, 131 feet of 2-inch galvanized iron pipe.

Madison street, 105 feet of 4-inch cast-iron pipe.

Rock avenue, 40 feet of 4-inch cast-iron pipe.

Witt street, 102 feet of 4-inch cast-iron pipe.

Main Pipe Relaid.

Beede avenue from Henry avenue, 124 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Boston street from Cedar street to Kirtland, 900 feet of 6-inch and 384 feet of 4-inch cement-lined pipe removed and relaid with 1284 feet of 6-inch cast-iron pipe.

Chestnut street from Jefferson street to Western avenue, 2182 feet of 6-inch cement-lined pipe removed and relaid with 1932 feet of 8-inch and 250 feet of 6-inch cast-iron pipe.

Cottage street from Boston to Summer street, 2317 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Essex street from Chestnut street to Tilton terrace, 914 feet of 8-inch cement-lined pipe removed and relaid with 10-inch cast-iron pipe.

Estes street from Howard street to Broad street, 860 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Fayette street from Collins street to B. & M. R.R. bridge, 2090 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Henry avenue from Washington street to Beede avenue, 916 feet of cement-lined pipe rmoved and relaid with 6-inch cast-iron pipe.

James street from Essex street to Stewart street, 360 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Myrtle street from Boston street to 60 feet beyond the second hydrant, 1183 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Norcross court from Lewis street, 415 feet of 1¼-inch and 1-inch pipe removed and relaid with 4-inch cast-iron pipe.

Oxford street from Buffum street to High street, 290 feet of 8-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

South Elm street from Summer street to Neptune street, 589 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Wells place from Chatham street, 120 feet of 1½-inch and 1¼-inch iron pipe removed and relaid with 2-inch galvanized iron pipe.

Services.

New services in Lynn	370
New services in Saugus	27
Services extended, Lynn and Saugus	25
Services discontinued	29
Services renewed	288
Services changed from old main to new	291
Services lowered	5
Services repaired	275
Service leaks repaired	360
Services frozen	8
Service pipes cleaned out, no force	2,096
New service boxes	422

New service boxes in place of old	35
Service boxes repaired and reset	193
Number of feet of lead lined iron pipe	34,419
Number of feet of galvanized iron pipe	3,398
Lead connections renewed with corporations	410
Lead connections renewed without corporations	71
New meters	408
Meters repaired	399
Meters changed	98
Meters repacked	53
Meters discontinued	16
Meter boxes, new	13
Meter boxes repaired	10
Finding and raising main gate-boxes	5
Main gate boxes repaired	6
Fire hydrants, new	15
Fire hydrants repaired	43
Fire hydrants moved	3
Private hydrants repaired	6
Main gates new	13
Main gates new in place of old	14
Main gates repaired	8
Main pipe leaks	91
Car sprinklers repaired	30
New fire pipes	
New gate boxes in place of old	24

Leaks Reported and Notices Issued.

Houses inspected	18,369
Faucets leaking	75
Water closets leaking	680
Bath tubs leaking	7
Pipe bursts	9
Bills and notices delivered	36,500
Meters read	8,000

Respectfully submitted,

D. A. SUTHERLAND,

Superintendent.

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1906.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	137,081,364	4,421,979	.....	1,445,632	51.84	316.92
February	132,788,668	4,742,452	.....	1,371,823	55.59	339.87
March	150,123,277	4,842,686	.....	327,169	56.77	347.04
April	141,366,029	4,712,201	40,357	.....	55.24	331.62
May	147,953,201	4,772,684	.....	186,333	55.95	342.05
June	154,052,293	5,135,076	456,250	.....	62.00	368.02
July	163,939,756	5,288,379	160,868	.....	61.99	378.79
August	180,728,415	5,829,949	1,008,204	.....	68.34	417.30
September	172,575,159	5,752,505	1,071,461	.....	67.43	412.20
October	167,354,463	5,398,531	711,949	.....	63.28	387.60
November	152,994,422	5,099,814	774,615	.....	59.78	364.06
December	172,497,910	5,564,446	1,239,741	.....	65.23	398.79
Totals and averages	1,873,454,975	5,132,753	209,193	.....	60.28	359.23

Basis: Population, Lynn and Saugus, 85,300.

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING THE YEAR 1906.

MONTH.	GALLONS.				
	Breed's	Birch	Walden	Hawkes	Total
January	66,163,450	......	66,163,450	......	132,326,900
February	53,671,933	40,035,600	40,124,917	......	133,832,450
March	53,496,367	99,625,783	......	......	153,122,150
April	59,059,292	82,881,458	......	......	141,940,750
May	56,044,680	91,581,520	......	......	147,626,200
June	......	67,966,400	82,839,300	......	150,805,700
July	......	......	164,331,400	......	164,331,400
August	16,491,988	......	165,222,637	......	181,714,625
September	41,942,873	87,744,300	44,393,477	......	174,080,650
October	62,863,158	35,411,075	......	66,886,167	165,160,400
November	39,346,093	......	55,904,595	60,310,837	155,561,525
December	......	......	171,027,000	......	171,027,000
Totals	449,079,834	505,246,136	790,006,776	127,197,004	1,871,529,750

Pumped from Hawkes to Walden, 755,550,125 gallons.
Pumped from Hawkes to Birch 196,677,250 gallons.

TABLE III.

SHOWING THE RAINFALL AT CITY HALL FOR 1906.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. . .	. . .	. . .	. . .	. . .	. . .	0.28	. . .	. . .	. . .	. . .	. . .
2	. . .	. . .	. . .	. . .	0.18	0.08	0.03	. . .	. . .	. . .	0.01	. . .
3	0.60	. . .	2.22	. . .	. . .	. . .	0.71	. . .	. . .	. . .	. . .	0.01
4	0.06	. . .	. . .	0.04	. . .	. . .	. . .	0.13	. . .	. . .	. . .	. . .
5	. . .	0.01	. . .	0.27	0.05	0 08	. . .	. . .	. . .	. . .	. . .	0.20
6	. . .	. . .	. . .	. . .	0.51	0.36	. . .	. . .	. . .	0.08	. . .	0.37
7	. . .	. . .	0.09	. . .	0.01	0.04	. . .	0.04	. . .	. . .	. . .	. . .
8	*0.02	*0.08	. . .	. . .	. . .	0.08	. . .	. . .	. . .	. . .	. . .	. . .
9	. . .	0.78	0.55	1.05	0.16	0.08	. . .	. . .	. . .	1.95	. . .	. . .
10	. . .	. . .	. . .	0.22	. . .	0.20	0.28	0.14	. . .	0.01	. . .	0.79
11	. . .	. . .	*0.22	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1.24	. . .
12	0.09	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.08	. . .	. . .	. . .
13	. . .	0.08	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	*0.01	. . .
14	*0.13	0.27	. . .	. . .	. . .	. . .	. . .	. . .	. .	. . .	. . .	0.07
15	. . .	. . .	*0.25	0.43	. . .	. . .	0.03	. . .	. . .	. . .	1.06	0.01
16	0.46	. . .	. . .	. . .	0.05	0.75	. . .	. . .	. . .	. . .	. . .	. . .
17	. . .	. . .	. . .	. . .	. . .	0.34	0.04	. . .	. . .	. . .	. . .	. . .
18	0.05	. . .	. . .	. . .	. . .	0.05	. . .	. . .	. . .	. . .	. . .	. . .
19	. . .	. . .	0.85	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
20	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.52	0.40	0.51	. . .	0.57
21	. . .	0.72	. . .	. . .	. . .	. . .	1.11	. . .	. . .	. . .	0.09	0.08
22	. . .	. . .	. . .	0.10	. . .	. . .	. . .	. . .	0.68	. . .	. . .	*0.27
23	0.38	. . .	. . .	0.01	. . .	0.13	0.11	0.45	. . .	. . .	. . .	. . .
24	. . .	. . .	. . .	. . .	0.12	. . .	. . .	. . .	. . .	. . .	. . .	. . .
25	. . .	0.36	. . .	. . .	0.05	. . .	. . .	. . .	. . .	0.17	. . .	*0.10
26	. . .	. . .	0.03	. . .	. . .	. . .	0.01	. . .	. . .	. . .	0.08	. . .
27	. . .	. . .	0.08	. . .	1.90	. . .	. . .	0.64	0.07	. . .	0.06	. . .
28	0.02	. . .	. . .	. . .	1.23	. . .	. . .	. . .	. . .	. . .	0.03	. . .
29	. . .	. . .	. . .	0.25	. . .	. . .	1.25	. . .	0.85	. . .	. . .	. . .
30	. . .	. . .	0.37	. . .	. . .	1.83	. . .	. . .	. . .	0.34	. . .	. . .
31	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.06	. . .	1.57
Total	1.81	2.30	4.66	2.37	4.26	4.02	3.85	1.92	2.08	3.12	2.58	4.04

December.
*0.02
. . .
*0.08
. . .
*0.19
0.40
. . .
*0.02
*0.13
0.70
. . .
. . .
. . .
0.01
0.04
. . .
. . .
. . .
. . .
0.42
0.07
*0.56
*0.02
. . .
*0.12
. . .
. . .
. . .
. . .
. . .
1.42
4.23

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TILDEN FOUNDATIONS.

TABLE III.

SHOWING THE RAINFALL AT CITY HALL FOR 1906.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1							0.28					
2					0.18	0.08	0.03				0.01	
3	0.60		2.22				0.71					0.01
4	0.06			0.04				0.13				
5		0.01		0.27	0.05	0.08						0.20
6					0.51	0.36				0.08		0.37
7			0.09		0.01	0.04		0.04				
8	*0.02	*0.08				0.08						
9		0.78	0.55	1.05	0.16	0.08				1.95		
10				0.22		0.20	0.28	0.14		0.01		0.79
11			*0.22								1.24	
12	0.09								0.08			
13		0.08									*0.01	
14	*0.13	0.27										0.07
15			*0.25	0.43			0.03				1.06	0.01
16	0.46				0.05	0.75						
17						0.34	0.04					
18	0.05					0.05						
19			0.85									
20								0.52	0.40	0.51		0.57
21		0.72					1.11				0.09	0.08
22				0.10					0.68			*0.27
23	0.38			0.01		0.13	0.11	0.45				
24					0.12							
25		0.36			0.05					0.17		*0.10
26			0.03				0.01				0.08	
27			0.08		1.90			0.64	0.07		0.06	
28	0.02				1.23						0.03	
29				0.25			1.25		0.85			
30			0.37			1.83				0.34		
31										0.06		1.57
Total	1.81	2.30	4.66	2.37	4.26	4.02	3.85	1.92	2.08	3.12	2.58	4.04

December.
*0.02
. . . .
*0.08
. . . .
*0.19
0.40
. . . .
*0.02
*0.13
0.70
. . . .
. . . .
. . . .
0.01
0.01
. . . .
. . . .
. . . .
. . . .
0.42
0.07
*0.56
*0.02
. . . .
*0.12
. . . .
. . . .
. . . .
. . . .
. . . .
1.42
4.23

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TILDEN FOUNDATIONS.

DAY OF MONT
1 . .
2 . .
3 . .
4 . .
5 . .
6 . .
7 . .
8 . .
9 . .
10 . .
11 . .
12 . .
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22 . .
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26 . .
27 . .
28 . .
29 . .
30 . .
31 . .
Total

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TILDEN FOUNDATIONS.

TABLE IV.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1898.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1							0.33				*0.01	*0.06
2					0.18	0.12	0.07				*0.04	
3	*0.72		2.30				0.62		0.07			*0.08
4	0.11			0.06				0.16				
5		*0.02		0.29	0.10	0.06						*0.19
6	*0.02	*0.03			0.60	0.43		0.02		0.09		0.40
7			0.08		0.06	0.06		0.04				
8	*0.10	*0.15				0.12		0.13				*0.02
9		0.93	*1.25	0.61	0.05	0.06				1.90		*0.13
10				0.23		0.18	0.22	0.06		0.03		0.70
11			*0.23								1.15	
12	0.12								0.09			
13		0.10			0.01						*0.01	
14	*0.32	*0.42		0.30								0.01
15	0.04		*1.07								1.02	0.01
16	0.70				0.07	0.74						
17						0.35	0.05					
18	0.05					0.11						
19			*1.12									
20				0.03				0.55	0.23	0.45		0.12
21		0.65					1.17				0.01	0.07
22				0.07					0.51			*0.56
23	0.35			0.06		0.18	0.09	0.15				*0.02
24					0.12					0.08		
25		0.35			0.05					0.12	0.05	*0.12
26			0.03				0.02	0.03			0.03	
27	0.05		0.07		1.73			0.51	0.08		0.10	
28					1.27						*0.20	
29				0.27	0.02	0.01	1.01		0.83			
30			0.43			1.68			0.05	0.32		
31			0.02							0.08		1.12
Total	2.58	2.65	6.60	1.92	4.26	4.13	3.58	1.98	1.80	3.05	2.65	4.23

*Snow.

Total for the year, 39.52.

TABLE V.

SHOWING THE DEPTH OF WATER IN PONDS FOR EACH WEEK DURING 1906.

DATE.	FEET.			
	Breed's Pond.	Birch Pond.	Hawkes Pond.	Walden Pond.
January 1	14-9	18-4	23-8	12-2
January 8	15-5	19-4	24-5	11-10
January 17	15-10	18-3	25-1	12-4
January 28	16-6	20-6	26-0	10-5
February 1	16-5	20-1	24-3	11-11
February 8	16-7	19-6	18-6	14-11
February 15	16-6	17-6	13-6	17-2
February 23	16-8	17-2	13-7	20-4
March 1	17-0	16-8	11-2	21-7
March 9	17-9	16-8	23-7	22-8
March 17	18-2	16-4	23-10	24-2
March 23	18-0	15-11	20-6	26-3
March 30	18-5	20-10	16-6	26-9
April 6	19-6	20-6	29-6	27-6
April 14	20-1	20-0	23-4	28-1
April 20	20-3	19-10	23-6	28-6
April 30	19-9	19-0	23-5	28-7
May 7	19-5	18-2	24-0	28-8
May 14	19-2	17-6	24-5	28-10
May 22	18-0	18-11	24-5	28-1
May 30	18-9	21-3	25-5	27-0
June 5	19-1	22-2	25-9	26-10
June 12	19-5	19-10	25-8	26-11
June 21	19-8	20-3	25-8	26-0
June 26	19-8	21-6	25-7	25-8
July 5	20-1	22-1	25-10	24-8
July 12	20-4	21-3	25-8	24-5
July 18	25-3	20-4	25-6	24-6
July 24	20-4	19-3	25-6	24-7
July 30	20-5	18-0	25-5	24-8
August 7	20-4	16-8	25-4	24-8
August 13	20-0	19-4	25-0	22-10
August 19	19-10	19-10	24-8	22-0
August 25	19-7	18-3	24-5	22-0
September 1	19-3	16-6	24-2	22-0
September 7	18-10	14-10	23-7	21-11
September 13	18-5	13-6	23-5	21-10
September 19	17-11	11-9	23-2	21-9
September 28	16-7	8-11	22-9	21-8
October 6	15-7	.....	22-6	21-6
October 12	14-4	.....	22-4	21-4
October 18	13-0	.....	20-0	21-8
October 27	11-7	8-6	18-4	21-8
November 3	10-4	8-7	16-11	21-8
November 9	9-2	8-7	16-0	21-7
November 15	8-5	8-8	15-3	21-9
November 24	6-6	14-10	16-5	19-5
December 1	6-9	18-2	16-8	17-2
December 7	6-10	20-2	16-11	15-8
December 13	7-7	21-3	17-3	14-4
December 22	8-7	20-3	17-10	14-6
December 28	9-3	19-5	18-8	14-9

TABLE VI.

SHOWING THE LOCATION OF GATES SET IN 1906.

STREET.	LOCATION.
Boston	On a line with the west side of North Federal street, 24 feet 6 inches south of the north side of Boston street.
Chestnut	1 foot south of the north line of Eade street, 16 feet west of the east side of Chestnut street.
Chestnut	On a line with the north side of Goodridge street, 14 feet 6 inches west of the east side of Chestnut street.
Chestnut	On a line with the south side of Western avenue, 12 feet 6 inches west of the east side of Chestnut street.
Cottage	On a line with the south side of Boston street, 15 feet 4 inches west of the east side of Cottage street.
Cottage	On a line with the south side of Woodman street, 15 feet 7 inches west of the east side of Cottage street.
Drexel Pl.	On a line with the east side of North Federal street 4 feet south of the north side of Drexel place.

TABLE VI—*Continued.*

STREET.	LOCATION.
Essex	On a line with the west side of Chestnut street, 16 feet 2 inches north of the south side of Essex street.
Essex	1 foot west of dividing line between City stables and No. 338 Essex street, 13 ft. 9 in. north of the south side of Essex street.
Fayette	On a line with the south side of Collins street, 17 feet 4 inches east of the west side of Fayette street.
Fayette	On a line with the north side of Essex street, 18 feet 6 inches east of the west side of Fayette street.
Fayette	On a line with the south side of Essex street, 29 feet 5 inches east of the west side of Fayette street.
Forest Hill avenue	6 feet 4 inches north of dividing line between No. 67 North Franklin street and No. 1 Forrest Hill avenue, 20 feet west of the east side of Forrest Hill avenue.
Graves avenue	On a line with the south side of Western avenue, 16 feet 10 inches west of the east side of Graves avenue.
Grove	16 feet 9 inches south of a point on a line with the south side of Linwood road, 14 feet 9 inches west of the east side of Grove street.

TABLE VI—*Continued.*

STREET.	LOCATION.
Henry avenue	8 feet 6 inches east of the east side of Lawton avenue, 19 feet 11 inches north of the south side of Henry avenue.
Lincoln	On a line with the south side of Essex street, 10 feet west of the east side of Lincoln.
Mason	On a line with the west side of Fayette street, 16 feet north of the south side of Mason street.
Maple Court at 210	On a line with the south side of Maple street, 15 feet 8 inches east of the west line of court.
Moulton	On a line with the south side of Amory street, 18 feet east of the west side of Moulton street.
Myrtle	8 inches north of the north line of Boston street, 12 feet west of the east side of Myrtle street.
Newhall	1 foot north of the north line of Washington street, 14 feet 4 inches east of the west side of Newhall street.
Norcross court	On a line with the south side of Lewis street, 12 feet east of the west side of Norcross court.

TABLE VI—*Continued.*

STREET.	LOCATION.
Olive	On a line with the west side of Fayette street, 31 feet north of the south side of Olive street.
Oxford	On a line with the east side of Buffum street, 12 feet 2 inches north of the south side of Oxford street.
Oxford	On a line with the west side of High street, 14 feet north of the south side of Oxford street.
Raddin Grove ave.	On a line with the west side of Summer street, 14 feet 8 inches north of the south side of Raddin Grove avenue.
Revere avenue	On a line with the north side of Walnut street, 18 feet west of the east side of Revere avenue.
Timsbury terrace	On a line with the north side of Ocean street, 5 feet east of the west side of Timsbury Terrace.
Washington place	On a line with the east side of Washington street, 4 feet north of the south side of Washington place.
Wells place	On a line with the east side of Chatham street, 6 feet 9 inches north of the south side of Wells place.
Verdmont avenue	On a line with the west side of Lynnfield street.

TABLE VII.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝ in.	¾ in.	1 in.	1½ in.	2 in	3 in.	4 in	Total
Lambert	816	919	127	21	26	....	...	1,909
Trident	750	815	96	4	4	....	....	1,669
Thomson	113	333	43	10	2	1	1	533
Hersey	80	63	11	.....	1	...	.....	155
Nash	50	14	1	.....	1	.....	....	66
Niagara	30	26	1	.....	.....	.....	.....	57
Columbia	43	7	.....	.....	.....	.....	.....	50
Ball and Fitts	23	15	10	.....	.....	.....	.....	48
Union	4	19	2	7	5	.....	9	46
Empire	11	11	3	4	4	1	1	35
Crown	1	6	1	1	.....	.....	.....	9
King	2	.....	.....	.....	.....	.....	.....	2
Worthington	1	1	.....	.....	.....	.....	.....	2
All Others	4	.....	1	2	.....	2	.....	9
Totals	1,958	2,229	296	49	43	4	11	4,590

TABLE VIII.

SHOWING CONSUMPTION IN GALLONS OF ESTIMATED AND METERED QUANTITIES.

Domestic, non-metered		805,532,209
Manufacturing, metered		500,000,000
Domestic, metered		350,000,000
Loss in registration, 5 per cent. estimated		4,250,000
Loss in distribution, 5 per cent. pumpage		93,672,748
CITY PURPOSES.		
Street Sprinkling	50,000,000	
Watering troughs	33,000,000	
Schools	17,000,000	
Fires	5,000,000	
Sewers	3,000,000	
Highway Department	3,000,000	
Engine houses	2,000,000	
Fountains	2,000,000	
City Hall	1,000,000	
Police Station	1,000,000	
Health Department	1,000,000	
Cemeteries	500,000	
Public Library	500,000	
Water Department	500,000	
All others	500,000	
		120,000,000
Total		1,873,454,957

TABLE IX.

SHOWING TOTAL LENGTH AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS.

	6 in.	2 in.	1¼ in.	1 in.	¾ in.	½ in.	Total
Lynn	205	1,467	818	9,171	3,949	40	15,150
Saugus[1]	....	....	76	1,600	627	....	2,303
Total	205	1,467	394	10,771	4,576	40	17,453

TABLE X.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1906.

WHERE LAID.	48 in.	10 in.	8 in.	6 in.	4 in.	Total.
Beede Ave.*	....	....	....	124	....	124
Boston St.*	....	....	....	1,284	....	1,284
Canal near Hawkes Pond	160	....	....	....	....	160
Chestnut St.*	....	....	1,932	250	....	2,182
Clark St.†	....	....	....	162	....	162
Cottage St.*	....	....	....	2,317	....	2,317
Eastern Ave.†	....	....	....	120	....	120
Echo Grove Ave.	....	....	....	350	....	350
Essex St.*	....	914	....	....	....	914
Estes St.*	....	....	....	860	....	860
Fayette St.*	....	....	....	2,090	....	2,090
Henry Ave.*	....	....	....	916	....	916
James St.*	....	....	....	360	....	360
Madison St.†	....	....	....	....	105	105
Myrtle St.*	....	....	....	1,183	....	1,183
Norcross Ct.*	....	....	....	....	415	415
Oxford St.*	....	....	290	....	....	290
Raddin Grove Av	....	....	....	302	....	302
Rock Ave.	....	....	....	....	40	40
South Elm St.*	....	....	....	589	....	509
Verdmont Ave.	....	....	....	....	592	592
Witt St.†	....	....	....	....	102	102
	160	914	2,222	10,907	1,214	15,467

	MILES.	FEET.
*Total length relaid	2	2,964
†Total length extended		520
Total length new		1,404
Total length of system	138	2,860
Total length in Swampscott		1,788
Total length in Saugus	19	3,487

Microscopical Examination of Water from Walden Pond, Lynn, Mass.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1906.	February 21.	April 18.	June 14.	August 9.	October 17.	December 13.
Number of Sample...	59278	60288	61009	61943	63293	64170
Plants.						
DIATOMACEÆ:	26	259	2002	15	103	65
Asterionella........	17	109	336	0	43	44
Cyclotella..........	2	12	854	0	4	0
Synedra...........	4	121	2	6	35	13
Tabellaria.........	0	17	810	6	19	8
CYANOPHYCEÆ:	0	0	34	1	18	0
Anabaena........	0	0	34	1	17	0
ALGÆ:	2	20	16	13	22	2
Animals.						
INFUSORIA:	[illegible]	8	5	192	23	5
Dinobryon	[illegible]	8	0	192	6	3
Monas	[illegible]	[illegible]	0	0	13	0
VERMES: (Polyarthra)	[illegible]	[illegible]	0	0	1	0
CRUSTACEA: (Cyclops)	[illegible]	[illegible]	34	[illegible]	36	0
MISCELLANEOUS:						
Crenothrix	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Zoogloea.	[illegible]	3	4	3	5	2
Total	177	358	2082	228	172	74

Microscopical Examination of Water from Breed's Pond, Lynn, Mass.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1906.	February 21.	April 18.	June 14.	August 9.	October 17.	December 13.
Number of Sample . . .	59276	60286	61025	61949	62290	64168
Plants.						
DIATOMACEÆ :	4	102	19	93	66	27
Tabellaria.........	0	39	1	61	38	0
CYANOPHYCEÆ :	0	0	2	10	9	0
Anabaene.........	0	0	2	0	9	0
ALGÆ :	0	5	2	444	6	0
Protococcus.......	0	0	2	428	0	0
Animals.						
INFUSORIA :	16	66	5	9	87	7
Dinobryon........	13	35	0	1	73	0
Mogleua..........	0	25	0	0	0	0
VERMES : (Polyarthra)	0	0	0	0	1	0
CRUSTACEA :						
Bosmino..........	0	0	.06	0	0	0
Cyclops...........	.01	0	.10	.02	.18	0
Sida.............	0	0	.04	0	0	0
MISCELLANEOUS:						
Crenothrix........	0	0	0	0	1	0
Zoogloea.........	1	3	2	4	4	3
Total.............	21	176	30	560	174	37

Microscopical Examination of Water from Birch Pond, Lynn, Mass.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1906.	February 21.	April 18.	June 14.	August 9.	October 17.	December 13.						
Number of Sample...	59275	60285	61024	61944	63291	64167						
Plants.												
DIATOMACEÆ:	139	366	221	13	237	15						
Asterionella	58	15	28	0	12	0						
Cyclotella	10	30	189	2	1	1						
Synedra	65	145	2	4	168	12						
Tabellaria.........	6	173	2	6	13	2						
CYANOPHYCEÆ:	0	0	38	0	2	0						
Anabaena.........	0	0	38	0	0	0						
ALGÆ:	3	1	11	3	8	9						
Animals.												
INFUSORIA:	54	27	57	272	35	0						
Dinobryon	25	16	0	264	29	0						
Englena	11	1	0	0	0	0						
Uroglena	0	2	43	0	0	0						
CRUSTACEA: (Cyclops)	.02	0	.04	.08	.04	0						
MISCELLANEOUS:												
Zoogloea..........	3	3	2	5	3	2						
Total.............	199	397	329	293	285	26						

DECEMBER 31, 1906.

BURNED.										
Total.	Ashes.		Average number of gallons pumped per lb. of coal.	Average number of gallons raised 100 feet high per lb. of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high, per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high, per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
Lbs.	Lbs.	Per cent.	Gals.	Gals.	Feet.	Lbs.	Lbs.	Gals.	Lbs.
144,500	22,746	15.74	550	781.23	142.04	65,146,164	77,316,727	12	20
245,100	37,197	15.17	564.6	830.27	147.05	69,244,771	81,633,711	27	15
252,200	37,325	14.80	562.8	744.17	132.23	62,066,615	72,847,936	25	15
47,300	6,723	14.21	607.5	861.92	141.88	71,898,592	83,808,282	6	10
72,000	8,656	12.02	678.8	967.47	142.53	80,695,408	91,722,489	10	15
56,500	8,138	14.40	688.6	1003.87	145.78	83,720,561	97,808,438	17	25
272,800	30,885	11.32	662.5	982.35	148.28	81,925,800	92,383,169	31	25
273,400	28,598	10.46	629.3	941.55	149.62	78,526,279	87,699,703	25	20
200,300	23,020	11.49	674.5	1031.93	152.99	86,067,430	97,243,401	20	20
221,900	25,180	11.35	644.3	979.62	152.04	81,696,661	92,153,768	16	25
183,900	20,213	11.00	635.9	924.25	145.35	77,082,692	86,601,301	8	13
1,969900	248,681	12.62	621.4	909.49	146.36	75,851,587	86,810,539	197	203

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

Microscopical Examination of Water from Hawkes Pond, Lynn, Mass.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1906.	February 21.	April 18.	June 14.	August 9.	October 17.	November 16.	November 28.	December 13.
Number of Sample ...	59277	60237	61008	61946	63292	63757	63857	64169
Plants.								
DIATOMACEÆ:	0	43	264	270	25	137	186	97
Asterionella	0	30	9	8	0	62	147	91
Cyclotella	0	0	208	19	21	47	32	4
Tabellaria	0	1	39	240	2	3	2	0
CYANOPHYCEÆ:	0	0	8	6	0	5	0	0
Anabaena	0	0	7	1	0	5	0	0
ALGÆ:	0	1	4	114	1	0	0	0
Protococcus	0	0	0	113	0	0	0	0
Animals.								
INFUSORIA:	526	12	0	1	154	4	1	2
Dinobryon	472	10	0	0	151	4	0	0
Glenodinium	17	0	0	0	0	0	0	1
Uroglena	22	0	0	0	0	0	0	0
VERMES:	6	0	0	0	1	0	0	0
CRUSTACEA:								
Bosmina	0	0	.08	0	0	0	0	0
Chydorus	0	.08	0	0	0	0	0	0
Cyclops	0	.02	0	.04	0	0	0	0
MISCELLANEOUS:								
Zoogloea	2	3	3	3	2	4	2	2
Total	534	59	279	394	183	150	189	101

SUMMARY OF STATISTICS.

FOR THE YEAR ENDING DECEMBER 31, 1906.

In form recommended by the New England Water Works Association.

LYNN WATER WORKS, LYNN, ESSEX CO., MASS.

GENERAL STATISTICS.

Population by census of 1905,	
Lynn.	77,00
Saugus	6,250
Date of construction	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and river
Mode of supply	Pumping to reservoir

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz

2. Description of fuel used,

   a. Kind, soft.

   b. Brand of coal used, George's Creek.

   c. Average price of coal per gross ton, delivered,

   d. Percentage of ash, 13.05

   e. Wood, price per cord.

3. Coal consumed for the year, in pounds.

Loretz.	Leavitt.	Auxiliary.
1,969,900	841,200	16,800

	Loretz.	Leavitt.	Auxiliary
4. [Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,			
4a. Amount of other fuel used,			
5. Total equivalent coal consumed for the year = (3) + (4), in pounds,	1,969,900	841,200	16,800
6. Total pumpage for the year, in gallons, with allowance for slip,	1,224,109,400	643,326.800	4,093,550
7. Average static head against which pumps work, in feet,	145.69	146.30	
8. Average dynamic head against which pumps work, in feet,	146.36	146.82	
9. Number of gallons pumped per pound of equivalent coal (5),	621.4	764.7	243.6

10. $$\text{Duty} = \frac{\text{gallons pumped (6)} \times 8.34\ \text{(lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5)}}$$

Loretz.	Leavitt.
75,851,557	93,644.796

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES

viz., $16,307.11

11. Per million gallons pumped,	$9.00
12. Per million gallons raised one foot (dynamic),	$ .058

FINANCIAL STATISTICS.

Receipts.			Expenditures.		
From meter rates,	$130,702.29		Maintenance,	$117,389.78	
From fixture rates,	113,684.29		Interest,	68,740.00	
			Sinking funds,	64,000.00	
Total water rates,		$244,386.58	Rebate to Saugus,	5,945.47	
From other sources,		16,009.61	Construction,	4,972.30	
			Balance to 1907,	1,336.86	
		$260,396.19			
Balance from 1905 construction.		1,988.22			
		$262,384.41			$262,384.41

Disposition of Balance, to Construction, 1907.

O. Net cost of works to date, ... $2,966,713.22
P. Bonded debt at date, ... 1,738,500.00
Q. Value of Sinking Fund at date, ... 153,262.36
R. Average rate of interest, .03¾ per cent.

STATISTICS OF CONSUMPTION OF WATER.

1.	Estimated population at date,	85,300
2.	Estimated population on lines of pipe,	85,300
3.	Estimated population supplied,	85,300
4.	Total consumption for the year (gallons),	1,878,454,975
5.	Passed through meters (gallons),	850,000
6.	Percentage of consumption metered,	40 per cent.
7.	Average daily consumption in gallons,	5,182,753
8.	Gallons per day to each inhabitant,	60.28
9.	Gallons per day to each consumer,	60.28
10.	Gallons per day to each tap,	359
11.	Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$60.00
12	Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$94.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1.	Kind of pipe,	Cement-lined, and cast iron.
2.	Sizes,	From 36 to 4 inch.
3.	Extended during year (feet),	529

4. Discontinued during year (feet),	None.
5. Total now in use (miles),	138
6. Cost of repairs per mile,	$186.00
7. Number of leaks per mile,	.082
8. Length of pipes less than 4 inches diameter (miles),	
9. Number of hydrants added during year (public and private),	15
10. Number of hydrants (public and private) now in use,	987
11. Number of stop gates added during year,	13
12. Number of stop gates now in use,	1,057
13. Number of stop gates smaller than 4-inch,	
14. Number of blow-offs,	67
15. Range of pressure on mains (pounds)	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	22,400
19. Discontinued (feet),	600
20. Total now in use (miles),	109
21. Number of service taps added during year,	397
22. Number now in use,	13,953
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00

25. Number of meters added,	466
26. Number now in use,	4,590
27. Percentage of services metered,	40 per cent.
28. Percentage of receipts from metered water (B÷C),	60 per cent.
29. Number of motors and elevators added,	
30. Number now in use,	4

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1907.

Compliments of

Public Water Board

Thomas Campbell, 2nd, Pres.

LYNN, MASS.
FRANK S. WHITTEN, PRI
1908.

Ri

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

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CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1907.

LYNN, MASS.
FRANK S. WHITTEN, PRINTER.
1908.

OFFICERS FOR 1907.

---

*Thomas Campbell, 2d, *President.*				
	Term expires	1st Monday	in April,	1908
Edward E. Pinkham	"	"	"	1909
Harry A. Swett	"	"	"	1910
Edward V. French	"	"	"	1911
John J. Heys	"	"	"	1912

Superintendent and Clerk, D. A. Sutherland.
Water Registrar, Wallace O. Mudge.
Pumping Engineer, Charles A. Cowles.
Assistant Engineer, George H. Venn.
Foreman of Mains, Edwin Maxwell.
Foreman of Services, Henry T. Wheelock.
Foreman of Meters and Repairs, W. H. McClain.

INSPECTORS.

Winslow J. Rowell.
J. Frank Pool.
William B. Moulton.
John Chamberlain.

CLERKS.

Mabel R. Butler.
Helene C. Pinkham.
L. Myrtle Hiller.
R. Guy Northey.

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* Re-elected April, 1908, for term ending April, 1913.

ANNUAL REPORT.

To the Honorable, the Mayor and City Council:

GENTLEMEN,—The Public Water Board submits the thirty-sixth annual report of the Department in accordance with the requirements of the city charter and the ordinances.

At the beginning of the year Mr. Eugene A. Bessom was the only member of the Board. Mr. Edward E. Pinkham was elected on February 19, and Mr. Edward V. French on March 5. The Board organized on May 6th with the election of Mr. Bessom as President, Mr. D. A. Sutherland was re-elected Clerk and Superintendent, and Mr. Wallace O. Mudge, Registrar.

Mr. John J. Heys and Mr. Harry E. Swett were elected as members of the Board on April 2. Mr. Bessom retired from the Board on June 18 and Mr. Thomas Campbell, 2d, was elected to the Board on the same day. On July 29, Mr. Campbell was elected President of the Board.

The present members of the Board were, therefore, all elected during the year. The new Board found a very large amount of work needing attention. In addition to the regular operation of the Department the whole question of improving and enlarging the water supply had to be considered. The year has, therefore been an exceedingly busy and exacting one.

Improvement and Increase of Water Supply.

An act of the Legislature, directing the Water Board to make certain investigations and submit plans for improving and increasing the supply, went into effect June 6, 1907; this Act is as follows:

CHAPTER 479.

AN ACT TO AUTHORIZE THE CITY OF LYNN TO ENLARGE AND IMPROVE ITS WATER SUPPLY AND TO MAKE AN ADDITIONAL WATER LOAN.

Be it enacted, etc., as follows:

SECTION 1. The city of Lynn, for the purpose of enlarging and improving its water supply, is hereby authorized to issue from time to time bonds, notes or scrip, to be denominated on the face thereof, Lynn Water Loan, Act of 1907, to an amount not exceeding $300,000 in addition to the amounts heretofore authorized by law to be issued by said city for similar purposes, which shall be payable at the expiration of periods not exceeding thirty years from the dates of issue, shall bear interest payable semi-annually at a rate not exceeding four per cent per annum, and shall be signed by the treasurer and countersigned by the Board of Water Commissioners and by the Mayor of the city The city may sell such securities at public or private sale, or pledge the same for money borrowed for the purposes of this Act, upon such terms and conditions as it may deem proper, provided that they shall not be sold for less than the par value thereof.

SECT. 2. The said city shall, at the time of authorizing said loan, provide for the payment thereof in such annual proportionate payments as will extinguish the same within the time prescribed by this Act; and when a vote to that effect has been passed the amount required thereby shall without further vote be assessed by the assessors of the city in each year thereafter in the same manner in which other taxes are assessed until the debt incurred by the loan is extinguished. The city shall also raise annually by taxation a sum which, with the income derived from water rates, will be sufficient to pay the interest as it accrues on the securities issued under authority hereof.

SECT. 3. The proceeds of the sale or pledge of the said securities shall be used for necessary expenditures in connection with the enlargement and development of the water supply system of the city, and for the protection and improvement of the quality of the water; and the city may take, or acquire by purchase or otherwise, and hold for said purposes any lands, easements or rights of way necessary for the purposes of this act, and for the purposes aforesaid may erect on any lands purchased, taken or held, proper dams, reservoirs, buildings, conduits, pipes, fixtures, filters or other structures necessary for the said purposes; provided, however, that no lands or rights therein shall be purchased, taken or used under this act without the consent of the State Board of Health, given after notice and a public hearing.

In carrying out the provisions of this act the City of Lynn shall have the authority and be subject to all the duties, restrictions and liabilities set forth in chapter two hundred and eighteen of the acts of the year eighteen hundred and seventy-one and acts in amendment thereof or addition thereto.

SECT. 4. The construction of the works necessary for the enlargement and development of the said water supply and for protecting and improving the quality of the water shall be begun by said city, acting through its public water board, within one year, and shall be completed within three years after the passage of this act. The said works shall provide an adequate quantity of good water for all the requirements of the city, for the proper sanitary protection of such water and for the elimination and diversion from the sources of supply of all polluted waters, or for their purification or treatment, in such manner as will fully protect the public health.

SECT. 5. The construction of the said works shall be carried out by the public water board of said city, and the board is hereby further authorized and directed to make all necessary preliminary investigations and to prepare plans for the works, and for this purpose shall have power to employ engineering experts as to the sanitary protection, storage, and purification of water, and such other assistance as may be necessary. The preliminary investigations herein authorized shall include: an estimate of the cost of cleansing and making sanitary the watersheds of Pillings pond and Beaver Dam brook, so-called, in the town of Lynnfield, and of the cost of connecting the same with the present sources of water supply, together with an estimate of the amount of increase in the supply of water obtainable by the use of said pond and brook; an estimate of the cost of a conduit or pipe line to convey water from the Ipswich river or Martin's brook either separately or in connection with the water of Pillings pond and Beaver Dam brook into the present reservoirs of the city of Lynn, or for pumping water either from said Ipswich river or said Martin's brook into said Pilling's pond or the present reservoirs by the plan deemed by said board to be most advisable; an estimate of the cost of cleaning or covering the bottom of Walden pond and of other ponds now used by the city of Lynn, or such parts of the bottom of Walden pond or the other ponds as have not so been treated; an investigation of the quality of the waters of all of the various sources and tributaries now used or available for the use of said city, with chemical and bacterial examinations thereof, at such points as may be agreed upon by the engineers and experts employed by the Lynn Water Board and the State Board of Health, including an investigation of all sources and causes of pollution or objection affecting the present or proposed sources of supply of the City of Lynn, the best methods of removing the same, and the estimated cost thereof.

SECT. 6. No act shall be done or liability incurred under this act enlarging or improving the water supply of the City of Lynn, except in the making of surveys and investigations and the preparation of plans hereby authorized, until plans of the proposed conduits, reservoirs, pipe lines, except distribution pipes, filters or other works necessary to provide an adequate quantity of pure water for the city have been submitted to and approved by the State Board of Health; and the said plans shall be presented to said Board for approval not later than December thirty-first, nineteen hundred and seven, and shall be acted upon by said Board on or before the third Wednesday in January in the year nineteen hundred and eight.

SECT. 7. This act shall take effect upon its passage. (Approved June 6, 1907.)

In complying with this act the Board, in agreement with the City Engineer, following the requirements of the charter, employed Mr. William S. Johnson, C. E., of Boston, as engineer to make the investigation required. Complete surveys and a very thorough study of the whole problem were made. The Board kept in touch with Mr. Johnson's work and gave much thought to the many various possibilities which were considered. An abstract of Mr. Johnson's report, giving fully the general conclusions, is attached. This report was submitted to the State Board of Health on December 31st as required by the act, with the statement that the Board had adopted Plan "B," which proposed filtering all of the water. The State Board of Health gave general approval to Plan "B" on January 15, 1908.

The investigation made in 1906 by Mr. X. H. Goodnough, engineer for the State Board of Health, and Mr. George I. Leland, engineer of the City of Lynn, had resulted in a report advising filters. Considerable opposition had been raised to this plan and the Board fully appreciated that the new study should be in every way so thorough and broad that all possible ways of improving and enlarging our water supply would be considered, and it was further felt that if an ample supply of thoroughly safe and palatable water could be obtained without filtration it was desirable to perfect plans to this end.

After a most careful and painstaking study we are unanimously convinced that the only way, within reasonable cost, to get a thoroughly safe and ample supply, always free from disagreeable tastes and odors, is to filter all of the water. If our ponds were remote from centers of population and of ample capacity a *safe* water could be secured by proper policing of the water-sheds, together with the purifying action which comes from long storage. It would further be possible under such conditions, by proper cleaning of the pond bottoms and proper draining of swamps, to secure a water of good color, and containing but a small amount of vegetable matter. Even under these conditions there would be likely at times to be growths of water organisms, both vegetable and animal, which would give an objectionable taste and odor to the water, but with several ponds and the ability to draw from any one of them, it would be generally possible to cut out ponds in which such trouble was occurring, as it would not usually occur simultaneously in all of them, and to deliver to the city a satisfactory water.

The conditions surrounding our only feasible sources of supply do not permit such a plan within reasonable cost. Our ponds are near the city and consequently subject to local pollution from the many persons who tramp over their water-sheds, and from the considerable population dwelling directly on the brooks which feed them, all of which introduces conditions which cannot be perfectly controlled even by the most careful policing. We must draw a considerable part of our supply from either the Saugus or Ipswich rivers, and both of these streams are polluted and the character of the water in neither of them is suitable for a public supply without some treatment. Further, even after the mud in the pond bottoms was removed or covered and new mains laid at large expense to permit the use of any one of the ponds, independent of the others, trouble from organisms would occur and bad tasting and smelling water would have to be used now and then. Finally the dangers of pollution would steadily increase with the growth of the city and the consequent certain increase of population in the country surrounding, from which our water would be collected.

Filters would, therefore, certainly become an absolute necessity in the not distant future. By providing them at once considerable expense otherwise necessary, but not later of great benefit when filters are built, is saved and our people get at once the benefits of the perfectly safe and always palatable water which filtering will give. Our plan would first utilize our present ponds to their fullest capacity, storing the water taken from Saugus river and later from the Ipswich river, in these ponds for a considerable time, then putting all the water through simple sand filters, thus getting the full advantage obtainable by combining storage and filtration.

Coming, as we have, to this conclusion slowly, we believe that a similar careful study would convince a great majority of the citizens of Lynn that this is the best plan, and that after actual use of water purified by storage and filteration, practically all would agree that we had a thoroughly excellent and satisfactory method of supply. With this plan we should have one of the best waters in the State, in place of a water now liable to pollution and often so offensive in taste and ordor for weeks, and sometimes months, that all who can afford spring water or house filters give up entirely the use of our public water as delivered from the house tap.

Leakage of Dams.

As a part of the study for the improving and enlarging of our supply it became desirable to ascertain the leakage of the dams of several of our present ponds. This work was carried out by Mr. Johnson and the results are given in full in his report attached.

"The leakage of Walden and Birch pond dams is excessive in comparison with similar dams, after making all allowances for differences in length and height. The dam at Birch pond has leaked for years and evidently conditions are not materially changing. It is probable that there is no special danger from this leak and it is also probable that it would not be feasible to stop the leak within any reasonable cost.

The action of Walden pond dam has been carefully watched and it is found that the leakage is quite evenly distributed for a considerable portion of the length of the dam, and that so far the leakage at any one point has not been large enough to cause fear for the safety of the dam. The indications, therefore, up to the date of the report are that the dam is not endangered by these leaks, but the evidence is that the dam could not be raised twenty feet more as originally intended without a good deal of re-building and a very large expense. This point is not vital, at least for years to come, if filters are put in, as the present capacity of the pond, taken with the other ponds, will give very ample storage when used in connection with filters. The loss of water is therefore the main feature, but as the supply available from the Saugus river and later from the Ipswich river will be ample for many years in the future, this does not mean a large money loss. The leakage of Hawkes pond is much less, especially when the size of the dam is considered."

Protection of Water-sheds.

The laws of the State empower the State Board of Health to make rules for the purpose of preventing the pollution of waters used for public supplies. On the request of our Board the State Board of Health have made a full set of rules applying to the water-sheds of our four ponds, and these rules are attached. The rules were printed as soon as received and copies circulated to all persons living on the water-sheds; then men in the employ of the Water Board were kept on the water-sheds all the time and every effort was made to remove sources of pollution.

Some bad conditions were found. A number of tight vaults have been built by the Board. Waste from a slaughter house has been properly cared for. Pollution from piggeries has been eliminated, and every effort made to safeguard the supply.

No rules were made by the State Board for Saugus river as it was felt that the conditions on its water-shed were such that rules could not be reasonably enforced. The dangers from Saugus river, which does receive much pollution directly, have been guarded against as far as possible by storing the water, as long as the city could be supplied from the other ponds, before using it during a wet season with the present consumption it is possible to store the water for a sufficient time to insure the complete destruction of all disease germs possibly present, but the time it is discharged into the distributing reservoir, but during a very dry year it would be necessary to use the water of Walden pond before it is absolutely certain that all disease germs are destroyed, and the health of those using the water would be necessarily endangered.

Improvements on Water-sheds and Ponds.

Some small areas of mud in the bottom of Walden pond at the north end were covered with gravel in the early spring when the water was low.

During the summer when Breed's pond was practically empty advantage was taken of the drying up of the bottom and about ten acres covered with gravel in the shallower portions in the vicinity of the Dungeon Rock road. This materially improved this part of the pond which was formerly unsightly and which tended to injure the water.

Considerable work has been done cleaning out the various brooks which supply the ponds. This cleaning has not gone to the full extent of deepening the brooks and draining swamps to which it is desirable to go eventually, and which is contemplated in the plan of improving and enlarging our supply proposed, but the work done has considerably bettered the conditions and will all be of value in connection with the more extensive treating of swamps, which it is hoped to do later.

Water Supply for the Year.

All water available from the sheds of our four ponds was used, but this was not enough to supply the city .On April 5, Saugus river was let into Hawkes pond, and continued flowing in until May 9, when the gates were closed. In these 34 days over six hundred million-gallons were taken from the river. This, together with the yield from the Hawkes shed was pumped to Walden pond.

While this was going on the city was supplied from Breed's and Birch ponds and these ponds were continued as the sole supply as long as they lasted, so as to permit the Saugus river water in Walden pond to purify as much as possible. On July [illegible] both ponds were too low for further use and the water from Walden pond was let down, thus the purification of Saugus river water was from May 6, when the river was shut off, to July [illegible]—[illegible] days, or a little over two months, a time much too short for full safety, but fortunately no trouble occurred.

From October 20 to November [illegible] a considerable growth of a microscopic animal organism, "Dinobryon," developed in Birch pond, and a larger growth in Walden. This gave the water a decidedly bad taste and odor. As little of the water was used as possible, but no other full supply was available so this water had to be used to a considerable extent.

Consumption

The present consumption is about seventy gallons per person per day. This is a reasonable consumption for a city situated as is Lynn. The Board believes that it is desirable as fast as conditions will permit to extend the use of meters and have adopted this policy. Metering permits the consumer to pay for just what water he uses and puts the selling of water on the same basis as all other commodities — water now being about the only thing that is not always sold in some measured quantity. Meters prevent waste of water, but with our present rates permit a most ample supply within reasonable cost for all legitimate uses. It is therefore believed that the general extension of meters is the best business policy and the fairest for all consumers.

Pumping Engines.

The pumping engine at Walden pond gave considerable trouble during the spring of the year from the water valves working out. It was found necessary to undertake considerable repairs to make the pump servicable for the work of the year 1908. The work was done under the direction of Mr. Cowles, new valves being carefully fitted, the work being quite labori ous, but all being done in a very thorough manner so that the pump was ready for work at the end of the year and believed to be in condition for satisfactory service.

One of the water cylinders of the Loretz engine on Walnut street cracked and was patched, and has been running satisfactorily ever since. As there is, however, an evident weakness, a new cylinder was cast and finished and is kept on hand so that it can quickly be put in place should the old one give way. Some other repairs of ordinary nature have been made on the pump and it has been kept almost constantly in service giving generally good results.

The Leavitt engine has been used for a small part of the time and has required only the ordinary repairs such as are necessary from time to time in any similar machinery.

Street Pipes.

As the Superintendent's report shows about four miles of cement pipe, varying in size from four to sixteen inch, was replaced with cast-iron during the year. There still remains about twenty-five miles of cement pipe. It is the intention of the Board to remove over half of this during the year 1908, taking out the sections which are known to be weak so that by the end of the year all that remains will be pipe of later date, which is believed to be mostly in good condition. With this done it will be possible to remove the reducing valve which now cuts down the pressure on the whole city, thus adding about twenty pounds throughout the city, raising it for example at the City Hall from the present pressure of fifty pounds to about seventy pounds. This will materially improve the fire service throughout the city, making hydrant streams of considerable more value in all of the sections in which there are low buildings. It will be especially beneficial for the many factories having automatic sprinklers for it will materially increase their efficiency. It will further better the general supply at all points.

Careful study is being given to the extension of pipes into different parts of the city so as to insure an ample supply of water for all contingencies. In many parts of the city there is a rapid growth of large wooden buildings, in many cases very closely packed together, making conditions which could readily produce a most serious fire. Much strengthening of the pipe system in the way of larger feeders and more perfect grid-ironing is consequently necessary to insure a sufficient water supply to make it possible to make a good fight in any of these districts. Many hydrants are being added and this work is being done in co-operation with Chief Harris of the Fire Department. The new hydrants are being staggered, part being put on one side of the street and part on the other. This reduces the chance of all the hydrants on a street being thrown out of service by a fire.

It will probably be necessary within a few years to lay a large new main from the reservoir to the center of the city so as to insure a most ample supply at any point to meet possible emergencies. All pipe work now undertaken is being done with these ideas in view, to the end that the final result may be complete and thoroughly strong distribution system.

Repair Shop.

The present repair shop which occupies the old wooden sheds in the City Hall yard is totally inadequate for the work which the Department has to do. In these cramped quarters all of the work in connection with meters, hydrants, services, valves, etc., has to be done. There is a totally insufficient space for properly storing supplies, and the work has to go on in such cramped quarters that there is much lost time, and it is not possible to secure efficient and economical results. Much work has to be done outside at a loss to the city. The Department needs a much larger and thoroughly up-to-date repair shop. General studies are being made to see what can be done and full recommendations will be submitted as soon as this matter is somewhat further developed.

Coal Testing.

The question of the grade of coal being obtained by the department came up in the early fall, and investigation showed that it would be desirable to obtain coal testing apparatus, so that all of the coal used could be tested from time to time and from the data obtainable information would be secured which would undoubtedly result in material savings. A Parr Calorimeter tester was consequently purchased and set up in the Walnut street engine house, where testing will be carried on under the direction of Mr. Cowles.

It was suggested that with this apparatus it would be possible and desirable for the Water Board to make tests of coal for such other departments in the city as desire the information. This can readily be done and it is expected that arrangements will be made for such work at all times.

Financial.

By order of the Council all unpaid water bills prior to 1907 were turned over to the City Treasurer so that the new Board started with a clean slate. Every effort has been made to collect all bills promptly, the ordinances are very specific as to the duty of the Board to shut off water in all cases of non-payment within a limited time. By notices in the papers and by circulars sent out with all bills this point was made known to all consumers and then insistence on payment was made. The result has been satisfactory and the following statement shows collections made, the amount due on January first, together with a brief summary of the financial condition of the department:

TREASURER'S STATEMENT.

Amount of debt December 19, 1906	$1,788,500 00	
Bonds matured and paid in 1907	10,000 00	
		$1,778,500 00
SINKING FUNDS.		
Amount of funds December 19, 1906	$389,262 36	
Received from City Treasurer in 1907	64,000 00	
Earnings of sinking funds in 1907	17,014 95	
	$470,277 31	
Deduct bonds paid in 1907	10,000 00	
	$460,277 31	
Amount in hands of City Treasurer	42,000 00	
		502,277 31
		$1,276,222 69

Water Maintenance.

RECEIPTS.

From water rates		$290,111 18

EXPENDITURES.

For maintenance	$174,896 18	
For interest	68,215 00	
Transfer to construction	5,000 00	
		248,111 18
Net income for year ending December 19, 1907,		$42,000 00

Land purchased in Lynnfield, 27 [illegible]/100 acres.

The Board has now obtained a generally good knowledge of the workings of the department and while there is much yet to do in the way of perfecting the organization of work, methods, etc., conditions are well developed for good progress in all directions.

Respectfully submitted,

PUBLIC WATER BOARD,

THOMAS CAMPBELL, 2D, *Pres.*
EDWARD V. FRENCH,
JOHN J. HEYS,
EDWARD E. PINKHAM,
HARRY A. SWETT.

The following reports are attached:

Page
Report of Wallace O. Mudge, Registrar . 18
Report of D. A. Sutherland, Superintendent . 25
Report of Board on The Public Water Supply of Lynn . . . 54
Report of William S. Johnson, Engineer, on Improving and Enlarging our Water Supply 69
Report of William S. Johnson, Engineer, on the Leakage of Dams 10
Rules of the State Board of Health for Safeguarding our Water-sheds, 78

REPORT OF WATER REGISTRAR.

To Thomas Campbell, 2d, President:

I herewith present the financial condition of the department for the year ending December 19, 1907.

RECEIPTS.

Meter rates, account 1907	$115,769 12	
Meter rates, account 1906	34,702 90	
Meter rates, account 1905	1,875 39	
		$152,347 41
Fixture rates, account 1907	$111,717 05	
Fixture rates, account 1906	7,562 97	
Fixture rates, account 1905	4,357 15	
		123,637 17
Miscellaneous		11,814 48
Additional		1,883 87
Fines		138 55
Total maintenance		$289,821 48
Construction, account 1907	$3,061 63	
Construction, account 1906	1,101 42	
Construction, account 1905	663 29	
		4,826 34
Total as per cash book		$294,647 82
Credited to account by the Treasurer		9 75
As per Auditor's statement		$294,657 57

MAINTENANCE.

Receipts		$290,111 18

EXPENSES.

Maintenance	$164,373 22	
Interest	68,215 00	
Rebate to Saugus	10,522 96	
Transfer to construction	5,000 00	
		248,111 18
Net earnings		$42,000 00

COMPARATIVE STATEMENT

Receipts in [illegible]		[illegible]
Receipts in [illegible]		[illegible]
Increase		[illegible]
Amount outstanding [illegible]		
Fixture rates, account [illegible]	[illegible]	
Fixture rates, account [illegible]	[illegible]	
Fixture rates, account [illegible]	[illegible]	
Meter rates, account [illegible]	[illegible]	
Meter rates, account [illegible]	[illegible]	
Meter rates, account [illegible]	[illegible]	
Miscellaneous	[illegible]	
Construction account [illegible]	[illegible]	
Construction account [illegible]	[illegible]	
Construction account [illegible]	[illegible]	
		[illegible]

The amount [illegible]

MAINTENANCE

Mains	[illegible]	
Services	[illegible]	
Meters	[illegible]	
Pumping, Walnut street	[illegible]	
Salaries and office	[illegible]	
Stable and shop	[illegible]	
Pumping, Walden pond	[illegible]	
System	[illegible]	
Breed's pond	[illegible]	
Damages	[illegible]	
Walden pond	[illegible]	
Miscellaneous	[illegible]	
Engine and boilers	[illegible]	
Brown-tail moths	[illegible]	
Saugus river	[illegible]	
Hawkes pond	[illegible]	
Hawkes pond canal	[illegible]	
Town of Saugus	[illegible]	
Birch pond	[illegible]	
Town of Lynnfield tax	[illegible]	
		[illegible]

CONSTRUCTION

Special—W. S. Johnson	[illegible]	
Land	[illegible]	
		[illegible]

Respectfully submitted,

WALLACE [illegible]

Water Registrar.

STATEMENT.

SHOWING COST OF WORKS TO JANUARY 1, 1908.

Mains, hydrants and gates	$883,595 30
Walden and Glen Lewis ponds	564,220 07
New supply and land	339,882 02
Services and courts	337,885 20
Engines and boilers	140,327 29
Hawkes pond	161,036 53
Reservoirs and land	131,581 49
Birch pond and land	93,471 84
Engine house, pump and conduit, Walden pond	83,003 72
Pipe conduits and land	81,289 39
Engine house and land	57,562 39
Breed's pond and land	57,135 28
Hawkes pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
Highland service	12,431 17
Engineering	11,157 95
Tubular wells	9,470 02
Filteration (special)	3,321 75
Workshop and stable	2,056 97
Compressor	515 00
	$3,131,242 33
Less amount received for pipe	165,122 60
Total net cost	$2,966,119 73

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc :

[illegible]

Number of services in [illegible]	[illegible]	
Number of services in [illegible]	[illegible]	
Total		[illegible]
Number put in during the year [illegible]	[illegible]	
Number put in during the year [illegible]	[illegible]	
Total		[illegible]
Number metered during the year [illegible]		
Number metered during the year [illegible]		
Total		[illegible]
Renewed	[illegible]	
Number discontinued	[illegible]	
Number not in use	[illegible]	
Turned on new services	[illegible]	
Turned on delinquent	[illegible]	
Turned on repairs	[illegible]	
Shut off for vacancy	[illegible]	
Shut off for non-payment		
Shut off for repairs	[illegible]	

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1907.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	12,890	1,213	14,103
Stores and shops	1,320	51	1,371
Factories	234	4	238
Offices	550	17	567
Restaurants and saloons	83	..	83
School-houses	60	11	71
Churches	33	5	38
Bakeries	30	..	30
Laundries	21	..	21
Engine-houses	12	3	15
Families	18,150	1,290	19,440
Boarding-houses	250	3	253
Faucets	34,667	2,150	36,817
Water-closets	16,110	625	16,735
Bath tubs	5,761	397	6,158
Hose bibs	3,291	201	3,492
Urinals	195	8	203
Heaters	397	85	482
Stationary engines	170	8	178
Motors	26	..	26
Green-houses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	23	1	24
Stand-pipes for water-carts	81	..	81
Sewer connections	25	..	25
Automatic sprinklers	125	5	130
Hydrants	855	175	1,030
Hydrants for car sprinklers	44	1	45

[illegible]

[illegible]

From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
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From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, 1892, to January 1, [illegible]	[illegible]
From January 1, 1893, to January 1, [illegible]	[illegible]
From January 1, 1894, to January 1, [illegible]	[illegible]
From January 1, 1895, to January 1, [illegible]	[illegible]
From January 1, 1896, to January 1, [illegible]	[illegible]
From January 1, 1897, to January 1, [illegible]	[illegible]
From January 1, 1898, to January 1, [illegible]	[illegible]
From January 1, 1899, to January 1, [illegible]	[illegible]
From January 1, 1900, to January 1, [illegible]	[illegible]
From January 1, 1901, to January 1, [illegible]	[illegible]
From January 1, 1902, to January 1, [illegible]	[illegible]
From January 1, 1903, to January 1, [illegible]	[illegible]
From January 1, 1904, to January 1, [illegible]	[illegible]
From January 1, 1905, to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
From January 1, [illegible], to January 1, [illegible]	[illegible]
	[illegible]

FUNDED WATER LOAN.

When Payable.	Rate Per Cent.	Amount.
April 1, 1908	3½	$10,000
April 1, 1909	3½	10,000
October 1, 1909	3½	100,000
April 1, 1910	3½	10,000
April 1, 1911	3½	10,000
November 1, 1913	4	20,000
November 1, 1914	3¾	31,000
March 15, 1915	4	50,000
December 1, 1914	4	20,000
December 1, 1915	3¾	6,000
April 1, 1916	3⅛	2,000
May 1, 1916	3½	24,500
September 1, 1916	4	10,000
October 1, 1916	4	9,000
February 1, 1917	3½	6,500
June 1, 1917	3½	3,500
July 1, 1917	4	7,500
August 1, 1917	4	5,000
October 1, 1917	4	2,000
November 1, 1917	4	6,500
April 1, 1918	4	15,000
June 1, 1918	4	10,000
July 1, 1918	4	50,000
April 1, 1919	4	100,000
July 1, 1919	4	110,000
January 1, 1920	4	35,000
April 1, 1920	4	150,000
April 1, 1921	4	50,000
October 1, 1921	4	25,000
January 1, 1922	4	50,000
July 1, 1922	4	25,000
April 1, 1923	4	40,000
July 1, 1925	4	165,000
July 1, 1926	4	50,000
September 1, 1927	4	25,000
July 1, 1928	4	25,000
October 1, 1928	4	10,000
July 1, 1929	4	25,000
January 1, 1930	4	25,000
October 1, 1930	4	25,000
July 1, 1931	3½	25,000
January 1, 1932	3½	75,000
April 1, 1932	3½	325,000
		$1,778,500

REPORT OF SUPERINTENDENT.

To the Public Water Board:

We have taken our supply of water during the past year from the following sources, Breed, Birch, Hawkes and Walden ponds, and Saugus river.

	Gallons.
Total pumpage in 1907	2,242,308,175
Total pumpage in 1906	1,871,529,750
Increase in pumpage in 1907	370,778,425
Total consumption in 1907	2,195,586,625
Total consumption in 1906	1,873,454,957
Increase in consumption in 1907	322,131,668

The average consumption of water per day in 1907 was 6,015,306 gallons, showing an average increase of 882,553 gallons per day more than in 1906. We attributed that large increase to an exceptional dry year. The rainfall in 1907 from January 1 to August 31 was 14.87 inches, it being the lightest rainfall since 1875 which was the beginning of the Water Department's record of rainfall.

The rainfall for the entire year was 35.29 inches which is several inches below the average.

The consumption of water per capita in 1906 was 60.28 gallons, in 1907, 70.52 gallons per capita, making an increase of 10.20 gallons for each consumer. Notwithstanding the large increase of the present year our consumption is much lower than any of the large cities, except those of which 88 per cent. or more of the services are metered.

New Pumps at Walden Pond.

In the early spring of 1906 when pumping into Walden pond it was discovered that many of the valves in the pumps had [illegible] [illegible] to the [illegible] [illegible] [illegible] to [illegible] and [illegible] [illegible] were made. The pumps have been thoroughly repaired and are now in good condition.

Water-shed.

The work begun in 1900 of clearing the woods and draining the swamps has been continued with good results, as many small ponds in the swamps have been connected with the ponds by suitable drains thereby, increasing the supply and improving the quality.

[illegible] fifty acres of land upon the water-shed has been purchased which insures better protection from pollution to our water supply.

The Saugus river dam at Montrose has been thoroughly repaired also the dam at the canal was rebuilt and two new gates were installed.

Breed's Pond.

Several acres of the shallow portion of the pond have been covered with gravel which will improve the color of the water which is of a higher color than any of the other reservoirs.

At Breed's pond a high fence has been constructed across that portion of the dam which contains a high masonry wall, as a protection to those who visit the place.

Following are the tables showing a detailed account of the work performed by the department.

Main Pipe New.

[illegible] avenue from Lynnfield street north 1,175 feet of [illegible] cast iron pipe.

[illegible] street from [illegible] street east 156 feet of 6-inch cast-iron pipe.

[illegible] avenue from Boston street north 630 feet of 6-inch cast iron pipe.

State road ([illegible] street extension), from Pleasant street 1,973 feet of 12-inch cast iron pipe.

Tracy avenue from Western avenue south 497 feet of 6-inch cast iron pipe.

Main Pipe Extended.

Avon street 173 feet of 6-inch cast-iron pipe.
Birch street 84 feet of 6-inch cast-iron pipe.
Blake street 156 feet of 4-inch cast-iron pipe.
Electric place 12 feet of 6-inch cast-iron pipe.
Ezra street 402 feet of 6-inch cast-iron pipe.
Light street 162 feet of 4-inch cast-iron pipe.
Linwood road 204 feet of 6-inch cast-iron pipe.

Main Pipe Relaid.

Amity street from Washington street to Newhall street, 656 feet of 4-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

Avon street from Summer street south 75 feet of 1¼-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Berkeley street from Spencer street 153 feet of 4-inch removed and relaid with 8-inch cast-iron pipe.

Burns street from Western avenue to Summer street, 258 feet of 1½-inch cement-lined pipe removed and relaid with 10-inch cast-iron pipe.

Collins street from Chatham street south 650 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Essex street from Tilton terrace to Lawton avenue, 3,348 feet 8-inch cement-lined pipe removed and relaid with 10-inch cast-iron pipe.

High street from Liberty street to Pearl street, 658 feet of 6-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

Holyoke street from Myrtle street to Gardiner street, 336 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Laconia court from Summer street south, 573 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Liberty street from High street west, 226 feet of 8-inch cement-lined pipe removed and relaid with 10-inch cast-iron pipe.

Light street from Ray street south, 559 feet of 4-inch cast-iron pipe removed and relaid with 6-inch cast-iron pipe.

Linwood street near Shillington avenue, 110 feet of 6-inch cast-iron pipe, relaid in place of 6-inch cast-iron pipe taken out to accommodate Sewer Department.

Lovett place from Lewis street pipe to gate, 24 feet of 1½-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Lyman street from Franklin street to Washington street, 686 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Myrtle street near No 79, 96-feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Nahant street from Ocean street south, 570 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Nahant-street place from Nahant street east, 487 feet of 4-inch cast-iron pipe removed and relaid with 8-inch cast-iron pipe.

Newhall street from Washington street to Broad street, 1,788 feet of 6-inch cement-lined pipe removed and relaid with 8-inch cast-iron pipe.

Northern avenue from North Franklin street, east 500 feet of 4-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

North Federal street from Walnut street south 306 feet of 16-inch cement-lined pipe removed and relaid with 16-inch cast-iron pipe.

North Franklin street from Boston street to Forest street, 855 feet of 6-inch cement-lined pipe removed and relaid with 6-inch cast-iron pipe.

Pinkham place from Pinkham street, west 221 feet of 2-inch cement-lined pipe removed and relaid with 4-inch cast-iron pipe.

Sea street from Market street to Pleasant street, 1,110 feet of 6-inch cement-lined pipe removed and relaid with 12-inch cast-iron pipe.

Spencer street from Waterhill street to Western avenue, 958 feet of 4-inch cement-lined pipe and 400 feet of 6-inch cast-iron pipe removed and relaid with 1,358 feet of 10-inch cast-iron pipe.

Summer street from Burns street, west 470 feet of 6-inch cast-iron pipe, removed and relaid with 10-inch cast-iron pipe.

Walnut street from pumping station to North Federal street, 1,357 feet of 16-inch cement-lined pipe removed and relaid with 16-inch cast-iron pipe.

Washington street from Newhall street to Boulevard, 1,060 feet of 8-inch cast-iron pipe.

Court Pipes New.

Barrett street, from Boston street, 320 feet of 2-inch galvanized iron pipe.

Cross court from Chase street, 131 feet of 1½-inch lead-lined pipe.

Court from 179 Franklin street, 91 feet of 1½-inch, and 70 feet of 1¼-inch galvanized iron pipe.

Gibson place from Green street, 166 feet of 2-inch galvanized iron pipe.

Court Pipes Extended.

Graves avenue, 458 feet of 1½-inch galvanized iron pipe.

Haddington place, 200 feet of 2-inch galvanized iron pipe.

Linwood place, 13 feet of 2-inch galvanized iron pipe.

Sluice road, 211 feet of 2-inch and 139 feet of 1½-inch galvanized iron pipe.

Woodman street, 56 feet 1¼-inch lead-lined pipe.

Court Pipes Relaid.

Chatham place, 20 feet 1½-inch iron pipe, removed and relaid with 1½-inch lead-lined pipe.

Lewis-street court, 14 feet of 1¼-inch cement-lined pipe removed and relaid with 1½-inch lead-lined pipe.

Court from 66 and 68 Prospect street, 110 feet of 1¼-inch cement-lined pipe removed and relaid with 1¼-inch lead-lined pipe.

Stone place, 23 feet of 2-inch cement-lined pipe removed and relaid with 2-inch galvanized iron pipe.

Sutton street, 189 feet of 2-inch cement-lined pipe removed and relaid with 2-inch galvanzed iron pipe.

Thompson court, 156 feet of 1¼-inch cement-lined pipe removed and relaid with 2-inch galvanized iron pipe.

Vivian place, 371 feet of 1½-inch iron pipe removed and relaid with 133 feet of 2-inch and 238-feet of 1½-inch galvanized iron pipe.

Wells place, 144 feet of 1¼-inch cement-lined pipe removed and relaid with 1½-inch galvanized iron pipe.

Services and Repairs.

New services in Lynn	402
New services in Saugus	48
Services extended Lynn and Saugus	29
Services discontinued	38
Services renewed	425
Services changed from old main to new	376
Services lowered	5
Services repaired	298
Service leaks repaired	435
Services frozen	160
Services cleared out, no force	2,661
Services changed	10
Service boxes new	455
Service boxes renewed	79
Service boxes repaired and reset	197
Number of feet of lead-lined pipe used	27,689
Number of feet of galvanized iron pipe used	3,987
Lead connections renewed with corporations	456
Lead connections renewed without corporations	50
New meters	432
Meters repaired	450
Meters changed	234
Meters repacked	50
Meters frozen	50
Meters discontinued	13
Meter boxes new	24
Meter boxes repaired	4
Finding and raising main gate boxes	16
Main gate boxes repaired and renewed	13
Fire hydrants new	30
Fire hydrants renewed	19
Fire hydrants repaired	57

Fire hydrants moved	14
Main gates new	22
Main gates renewed	31
Main gates repaired	5
Main pipe leaks	91
Car sprinklers repaired	19
New fire pipes	6
Private hydrants new	6
Private hydrants repaired	8

Microscopical Examination of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 13.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64604	64925	65297	65620	65975	66369	66750	67680	68008	68525	30544	69545
Plants.												
DIATOMACEÆ:												
Asterionella	5	0	0	17	10	35	0	10	216	442	139	7
Cyclotella	0	0	0	1	16	15	11	3	4	8	0	5
Synedra	1	0	0	19	380	31	6	4	1	0	37	7
Tabellaria	2	0	0	5	206	57	29	0	86	24	8	20
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	10	1	0	3	0	0	0
ALGÆ:												
Protococus	0	0	0	0	0	0	0	0	22	6	0	0
Raphidium	0	0	0	0	0	0	0	0	10	22	0	1
Animals.												
INFUSORIA:												
Dinobryon	4	0	0	5	68	0	1408	0	64	578	0	1048
Glenodinium	0	1	1	1	0	1	0	0	0	0	0	0
Trachelomonas . . .	0	0	0	0	0	0	0	0	22	8	0	0
Peridinium	0	0	5	1	2	0	0	0	0	0	6	0
Synura	0	0	0	0	0	0	0	0	5	22	1	0
VERMES: (Pnurea) . .	1	0	0	0	0	0	0	0	0	0	0	0
Palyarthra	0	0	0	0	2	0	0	0	0	0	2	0
CRUSTACEA: (Cyclops)	0	.04	0	0	0	0	.04	0	0	0	0	.02
MISCELLANEOUS:												
Zoöglœa	1	0	0	2	4	3	5	3	3	3	5	5
Total	14	10	6	51	688	152	1464	20	436	1113	198	1093

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 12.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64605	64922	65298	65621	65976	66370	66753	67685	68010	68527	38274	69547
Plants.												
DIATOMACEÆ:												
Asterionella	1	0	0	3	29	315	41	0	7	0	39	3
Cyclotella	0	0	0	0	0	0	0	39	6	0	0	0
Synedra	2	0	0	4	224	18	5	0	4	25	20	1
Tabellaria	0	0	0	5	37	156	270	37	4	5	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	8	13	13	0	1	6	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	12	0	19	0	0	0
Paphidium	0	0	0	0	0	0	2	3	0	3	0	0
Animals.												
INFUSORIA:												
Dinobryon	77	0	0	119	49	9	235	0	0	59	0	0
Glenodinium	5	0	0	2	2	0	0	0	0	1	0	0
Chlamydomonas . .	45	31	0	0	0	0	0	0	0	0	0	1
Mallomonas	0	1	2	0	0	1	0	0	0	0	1	1
Raphidomonas . . .	0	0	0	0	0	35	0	0	0	0	0	0
VERMES: (Polyarthra)	0	0	0	0	1	3	0	0	0	0	1	0
CRUSTACEA: (Cyclops)	.02	14	.06	0	0	.02	.04	.04	0	.02	0	0
Bosmina		.02										
MISCELLANEOUS:												
Zoöglœa	2	1	0	2	3	2	3	6	3	5	5	2
Total	132	33	2	135	353	552	581	85	44	104	66	8

Microscopical Examination of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 12.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64604	64925	65297	65620	65975	66369	66750	67680	68008	68525	30544	69545
Plants.												
DIATOMACEÆ:												
Asterionella.	5	0	0	17	10	35	0	10	216	442	139	7
Cyclotella	0	0	0	1	16	15	11	3	4	8	0	5
Synedra	1	0	0	19	380	31	6	4	1	0	37	7
Tabellaria	2	0	0	5	206	57	29	0	86	24	8	20
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	10	1	0	3	0	0	0
ALGÆ:												
Protococus	0	0	0	0	0	0	0	0	22	6	0	0
Raphidium	0	0	0	0	0	0	0	0	10	22	0	1
Animals.												
INFUSORIA:												
Dinobryon	4	0	0	5	68	0	1408	0	64	578	0	1048
Glenodinium	0	1	1	1	0	1	0	0	0	0	0	0
Trachelomonas . . .	0	0	0	0	0	0	0	0	22	8	0	0
Peridinium	0	9	5	1	2	0	0	0	0	0	6	0
Synura	0	0	0	0	0	0	0	0	5	22	1	0
VERMES: (Pnurea) . .	1	0	0	0	0	0	0	0	0	0	0	0
Palyarthra	0	0	0	0	2	0	0	0	0	0	2	0
CRUSTACEA: (Cyclops)	0	.04	0	0	0	0	.04	0	0	0	0	.02
MISCELLANEOUS:												
Zoöglœa	1	0	0	2	4	3	5	3	3	3	5	5
Total	14	10	6	51	688	152	1464	20	436	1113	198	1093

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 12.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64605	64922	65298	65621	65976	66370	66753	67685	68010	68527	38274	69547
Plants.												
DIATOMACEÆ:												
Asterionella	1	0	0	3	29	315	41	0	7	0	39	3
Cyclotella	0	0	0	0	0	0	0	39	6	0	0	0
Synedra	2	0	0	4	224	18	5	0	4	25	20	1
Tabellaria	0	0	0	5	37	156	270	37	4	5	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	8	13	13	0	1	6	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	12	0	19	0	0	0
Paphidium	0	0	0	0	0	0	2	3	0	3	0	0
Animals.												
INFUSORIA:												
Dinobryon	77	0	0	119	49	9	235	0	0	59	0	0
Glenodinium	5	0	0	2	2	0	0	0	0	1	0	0
Chlamydomonas . .	45	31	0	0	0	0	0	0	0	0	0	1
Mallomonas	0	1	2	0	0	1	0	0	0	0	1	1
Raphidomonas . . .	0	0	0	0	0	35	0	0	0	0	0	0
VERMES: (Polyarthra)	0	0	0	0	1	3	0	0	0	0	1	0
CRUSTACEA: (Cyclops)	.02	14	.06	0	0	.02	.04	.04	0	.02	0	0
Bosmina		.02										
MISCELLANEOUS:												
Zoöglœa	2	1	0	2	3	2	3	6	3	5	5	2
Total	132	33	2	135	353	552	581	85	44	104	66	8

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 12.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64606	64926	65299	65622	65977	66371	66754	67086	68012	68529	38275	69552
Plants.												
DIATOMACEÆ:												
Asterionella	0	0	0	1	54	22	0	0	0	9	49	0
Cyclotella	2	0	0	0	2	0	3	15	3	4	47	0
Synedra	0	0	4	25	700	24	1	1	1	2	0	5
Tabellaria	0	0	0	6	36	1	0	37	19	1	0	1
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	0	20	0	10	0	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	33	0	0	0	0	0
Raphidium	0	0	0	1	0	0	0	0	0	0	0	0
Animals.												
INFUSORIA:												
Dinobryon	4	0	0	40	50	0	0	0	22	44	1	0
Glenodinium	1	0	0	1	0	0	0	0	0	0	0	0
Peridinium	0	9	0	0	0	0	0	0	0	0	0	0
Synura	0	0	0	5	0	0	0	0	0	0	0	0
Trachelomonas . . .	0	0	0	0	0	0	0	0	11	0	0	0
VERMES: (Sychaeta)	0	0	0	1	0	0	0	0	0	0	0	0
CRUSTACEA: (Cyclops)	08	.12	0	0	0	0	18	0	0	0	0	0
MISCELLANEOUS:												
Zoöglœa	1	0	1	1	3	2	2	5	10	6	3	3
Total	8	9	5	81	845	49	59	58	76	66	100	9

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1907.	January 28.	February 13.	March 13.	April 12.	May 15.	June 12.	July 12.	August 30.	September 21.	October 21.	November 11.	December 17.
Number of Sample . .	64607	64923	65300	65623	65978	66372	66756	67687	68014	68532	69540	69552
Plants.												
DIATOMACEÆ:												
Asterionella	3	0	1	11	91	191	30	6	17	65	114	117
Cyclotella.	0	0	1	0	3	24	100	36	1	8	0	13
Synedra	0	1	2	17	124	19	0	0	19	14	0	22
Tabellaria	0	1	0	0	7	177	846	44	84	74	118	20
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	13	72	0	31	1	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	0	0	22	0	0	0
Raphidium	0	0	0	1	0	2	0	0	1	2	0	6
Animals.												
INFUSORIA:												
Dinobryon	0	0	0	8	14	0	280	0	34	1728	0	2328
Glenodinium !	4	2	0	4	1	0	0	0	0	0	0	0
Peridinium	8	1	0	2	0	0	0	0	0	0	5	0
Synura	0	0	0	0	0	0	0	0	0	0	0	0
VERMES: (Anurea)	0	0	0	0	0	0	0	0	0	1	5	0
CRUSTACEA: (Cyclops)	0	.02	0	0	0	0	0	.05	.02	0	0	0
MISCELLANEOUS, Zoöglœa	1	1	1	5	3	1	3	0	6	8	5	3
Total	16	6	5	48	243	427	1331	92	215	1901	247	2515

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1907.

MONTH.	GALLONS.				
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average to each inhabitant per day.	Average to each service per day.
January	181,620,365	5,858,721	1,436,742	68.68	406.77
February	183,327,004	6,547,393	1,804,941	76.75	454.58
March	187,208,731	6,038,991	1,196,305	70.79	419.28
April	173,630,896	5,787,696	1,075,494	67.85	401.83
May	184,569,524	5,953,855	1,181,171	69.79	413.37
June	188,024,237	6,267,474	1,132,398	73.47	435.15
July	204,806,261	6,606,653	1,318,274	77.45	458.69
August	201,621,830	6,503,930	673,981	76.24	451.56
September	178,762,654	5,958,755	206,250	69.85	413.71
October	181,405,907	5,851,803	453,272	68.60	406.30
November	156,177,746	5,205,925	106,111	61.03	361.37
December	174,431,470	5,626,821	62,375	65.96	390.67
Totals and averages	2,195,586,625	6,015,306	882,553	70.52	417.77

Basis: Population, Lynn and Saugus, 85,300.
Delivered from reservoir to Breed's pond, December, 45,000,000 gallons.

Gallons

PUBLIC LIBRARY

TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1907.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	.35	.38	*.19	. .	. .	. .	. .	. .	. .	. .	. .
2	. .	. .	. .	. .	. .	.75	. .	. .	.27	. .	.59	. .
3	.21	. .	. .	. .	. .	.26	. .	.11	.86	.27	. .	*.01
4	.20	*.36	. .	.02	.48	. .	. .	.18	.03	.14	. .	*.01
5	. .	*.03	. .	. .	. .	.10	. .	. .	.85	. .	. .	*.01
6	. .	. .	. .	. .	.29	. .	. .	. .	. .	. .	1.37	. .
7	. .	. .	. .	. .	. .	. .	. .	. .	. .	.48	.01	. .
8	. .	. .	. .	*1.03	.08	.	. .	. .	.17	.56	. .	. .
9	. .	. .	.	.54	. .	. .	. .	. .	. .	. .	.45	. .
10	. .	. .	*.17	. .	.70	. .	. .	. .	. .	. .	.13	1.25
11	. .	. .	. .	. .	*.07	. .	.46	. .	.24	. .	. .	. .
12	. .	. .	.18	. .	. .	. .	. .	. .	. .	. .	. .	. .
13	. .	. .	.05	. .	. .	. .	. .	. .	. .	. .	. .	. .
14	*.45	. .	.05	. .	. .	. .	. .	. .	. .	. .	. .	1.08
15	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
16	. .	. .	. .	. .	.36	. .	. .	. .	. .	. .	. .	. .
17	02	*.04	. .	. .	. .	. .	. .	.05	. .	. .	. .	. .
18	. .	. .	. .	. .	. .	.43	.10	. .	. .	. .	.29	. .
19	.25	* 08	*.36	.04	.24	.11	. .	. .	. .	. .	. .	. .
20	. .	*.22	. .	. .	. .	.22	.24	. .	. .	.35	. .	. .
21	. .	. .	. .	. .	. .	. .	. .	.16	.18	. .	.04	. .
22	*.08	. .	. .	. .	. .	. .	. .	. .	.96	. .	. .	. .
23	. .	. .	. .	.30	. .	. .	. .	. .	1.01	. .	. .	.68
24	. .	*.15	*.28	. .	. .	. .	.10	. .	.01	. .	2.25	. .
25	*.39	. .	. .	. .	. .	. .	. .	. .	. .	. .	.85	. .
26	. .	. .	. .	. .	.23	. .	.32	. .	. .	. .	.07	. .
27	*.04	. .	.25	. .	.30	. .	. .	.02	. .	. .	. .	. .
28	. .	. .	.03	. .	. .	. .	. .	. .	1.53	.55	. .	. .
29	. .	. .	. .	. .	. .	.92	. .	. .	1.85	.07	. .	. .
30	*.04	. .	. .	. .	. .	. .	. .	.49	. .	. .	. .	.65
31	*.07	. .	.19	. .	. .	. .	. .	. .	. .	. .	. .	. .
Total	1.75	1.23	1.94	2.12	2.81	2.79	1.22	1.01	7.96	2.42	6.05	3.69

*Snow.

Total for the year, 35.29 inches.

Rain gauge located on roof of stable at rear of City Hall. The gauge was changed from the roof of the City Hall to its present position on account of obstructions on the roof.

TABLE V.

SHOWING THE LOCATION AND SIZE OF GATES SET IN 1907.

STREET.	LOCATION.
Amity	8-inch gate. 6 inches east of the west side of Newhall street, 18 feet 4 inches north of the south side of Amity street.
Amity	8-inch gate. On the line of the east side of Washington street, 15 feet 8 inches north of the south line of Amity street.
Avon	6-inch gate. On the line of the south side of Dearborn avenue, 15 feet 6 inches east of the west side of Avon street.
Barrett	2-inch valves. On the line of the south side of Boston street, 18 feet 6 inches west of the east side of Barrett street.
Berkley	8-inch gate. On the line of the east side of Spenser street, 14 feet south of the north side of Berkley street.
Burns	10-inch gate. 8 inches north of the north side of Western avenue, 14 feet 7 inches west of the east side of Burns street.
Chestnut	10-inch gate. On the line of the south side of Essex street, 18 feet 9 inches west of the east side of Chestnut street.
Collins	6-inch gate. 4 feet 4 inches west of the east line of Chatham street, 14 feet 10 inches north of the south side of Collins street.
Colonial avenue	6-inch gate. On the line of the northwest side of Lynnfield street, 13 feet southwest of the northeast side of Colonial avenue.
Cross court	1½-inch valve. On the line of the west side of Chase street.

TABLE V—*Continued.*

STREET.	LOCATION.
Essex	10-inch gate. On the line of the east side of Fayette street, 13 feet north of the south side of Essex street.
Essex	10-inch gate. On the line of the west side of Ireson street, 16 feet 5 inches north of the south side of Essex street.
Essex	10-inch gate. On the line of the east side of Mansir place, 38 feet 6 inches south of the north side of Essex street.
Essex	8-inch gate. On the line of the east side of Lawton avenue, 10 feet 10 inches north of the south side of Essex street.
Ezra	6-inch gate. On the line of the west side of Chestnut street, 36 feet 3 inches south of the north side of Ezra street.
Gas House road	10-inch gate. 3 feet north of the line of the south side of the State road, 7 feet 8 inches east of the west side of the Gas House road.
Gas House road	6-inch gate. 28 feet west of the west side of the power house, 41 feet north of the north end of power house.
Gas House road	6-inch gate. 6 inches west of the line of the west side of the power house, 35 feet 1 inch north of the north end of power house.
Gibson place	2-inch valve. On the line of the west side of Green street, 3 feet 3 inches north of the south side of Gibson place.
High	8-inch gate. On the line of the south side of Liberty street, 15 feet 6 inches east of the west side of High street.
Liberty	10-inch gate. On the line of the west side of High street, 18 feet 6 inches north of the south side of Liberty street.
Light	4-inch gate. 3 feet 6 inches south of the last hydrant, 17 feet east of the west side of Light street.

TABLE V.—*Continued.*

STREET.	LOCATION.
Linden	8-inch gate. 8 inches north of the north line of Summer street, 15 feet 5 inches west of the east side of Linden street.
Linden	8-inch gate. 6 inches north of the north line of Elizabeth street, 17 feet west of the east side of Linden street.
Linden	8-inch gate. On the line of the west side of Linden street, 15 feet 4 inches south of the north side of Linden street.
Lovett place	6-inch gate. On the line of the south side of Lewis street, 11 feet east of the west side of Lovett place.
Lyman	6-inch gate. On the line of the south corner of Franklin and Lyman streets, 12 feet 6 inches south of the north side of Lyman street.
Lyman	6-inch gate. On the line of the west side of Washington street, 17 feet 7 inches south of the north side of Lyman street.
Morris	6-inch gate. 1 foot 6 inches east of the line of the east side of Linden street, 38 feet 7 inches north of the south side of Morris street.
Murray place	2-inch valve. On the line of the west side of Murray street, 44 feet south of the dividing line between Nos. 52 and 56.
Nahant-street place	8-inch gate. 3 feet 3 inches east of the east line of Nahant street, 14 feet 6 inches north of the south side of Nahant-street place.
Newhall	8-inch gate. On the line of the east corner of Broad and Newhall streets, 16 feet 5 inches east of the west side of Newhall street.
Newhall	8-inch gate. 2 feet 4 inches north of the north side of West Baltimore street, 15 feet 1 inch east of the west side of Newhall street.
Newhall	8-inch gate. 1 foot 6 inches south of the north line of Amity street, 17 feet east of the west side of Newhall street.

TABLE V—*Continued.*

STREET.	LOCATION.
Newhall	8-inch gate. On the line of the north side of Washington street, 14 feet 4 inches east of the west side of Newhall street.
Northern avenue....	6-inch gate. On the line of the east side of North Franklin street, 9 feet 9 inches north of the south side of Northern avenue.
North Federal	16-inch gate. On the line of the south side of Walnut street, 16 feet 11 inches west of the east side of North Federal street.
Pinkham place......	4-inch gate. On the line of the west side of Pinkham street, 12 feet 9 inches south of the north side of Pinkham place
Pleasant............	8-inch gate. On the line of the north side of Sea street, 17 feet 6 inches west of the east side of Pleasant street.
Rollins avenue.....	6-inch gate. 8 inches north of the north side of Boston street, 10 feet 10 inches east of the west side of Rollins avenue.
Sea	12-inch gate. 3 feet east of the hydrant near corner of Market street, 18 feet 9 inches south of the north side of Sea street.
Sea	12-inch gate. On the line of the east side of Pleasant street, 23 feet 7 inches south of the north side of Sea street.
Spenser	10-inch gate. On the line of the south side of Waterhill street, 19 feet 8 inches west of the east side of Spenser street.
Spenser	10-inch gate. On the line of the north side of Woodman street, 17 feet west of the east side of Spenser street.
Spenser	10-inch gate. On the line of the north side of Western avenue, 17 feet west of the east side of Spenser street.
State road	12-inch gate. On the line of the west side of Gas House road, 26 feet 9 inches south of the north side of State road.

TABLE V—*Continued.*

STREET.	LOCATION.
Sutton	2-inch valve. On the line of the south side of Essex street, 18 feet 9 inches west of the east side of Sutton street.
Tracy avenue	6-inch gate. On the line of the south side of Western avenue, 16 feet west of the east side of Tracy avenue.
Washington	8-inch gate. On the line of the east side of Newhall street, 12 feet 3 inches north of the south side of Washington street.
Western avenue	10-inch gate. 20 feet 8 inches east of the west end of B. & N. R. R. car barn, 18 feet 7 inches south of the north side of Western avenue.
Court at 179 F'klin st.	1¼-inch valve. On the line of the east side of Franklin street, 16 feet south of the line of the south side of house No. 179.

TABLE VI.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	Total
Lambert	1,034	1,211	177	34	36	. . .	. . .	2,492
Trident	754	814	81	4	3	. . .	. . .	1,656
Thompson	116	270	39	8	2	1	1	437
Hersey	79	69	11	. . .	1	. . .	. . .	160
Nash	50	14	1	. . .	1	. . .	. . .	66
Niagara	28	24	1	. . .	. . .	. . .	. . .	53
Ball and Fitts	16	15	10	. . .	. . .	. . .	. . .	41
Union	3	18	2	5	5	. . .	8	41
Columbia	34	. . .	. . .	. . .	. . .	. . .	. . .	34
Empire	11	10	3	4	3	1	1	33
Crown	1	6	1	. . .	. . .	. . .	. . .	8
King	2	. . .	. . .	. . .	. . .	. . .	. . .	2
Worthington	1	1	. . .	. . .	. . .	. . .	. . .	2
All others	4	. . .	1	2	. . .	2	. . .	9
Total	2,133	2,452	327	57	51	4	10	5,035

TABLE VII.

SHOWING THE TOTAL LENGTH AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1907.

	8 in.	6 in.	4 in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	Total.
Lynn . .	174	213	127	227	408	1,166	8,519	4,933	15,767
Saugus .	....	....	....	12	....	....	1,029	1,222	2,263
Total .	174	213	127	239	408	1,166	9,548	6,155	18,030

TABLE VIII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1907.

WHERE LAID.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	Total.
Amity*	. .	. . .	. . .	650	5	. . .	655
Avon*	. . .	. . .	. . .	. . .	75	. . .	75
Avon*	. . .	. . .	. . .	. . .	173	. . .	173
Berkeley*	. . .	. . .	. . .	153	. . .	. . .	153
Birch*	. . .	. . .	. . .	. . .	84	. . .	84
Blake*	. . .	. . .	. . .	. . .	. . .	150	150
Burns*	. . .	. . .	258	. . .	16	. . .	274
Collins*	. . .	. . .	. . .	. . .	650	. . .	650
Colonial avenue	. . .	. . .	. . .	. . .	1,175	. . .	1,175
Electric place†	. . .	. . .	. . .	. . .	12	. . .	12
Essex*	. . .	. . .	3,348	74	274	18	3,714
Ezra†	. . .	. . .	. . .	. . .	402	. . .	402
High*	. . .	. . .	. . .	658	6	. . .	664
Holyoke*	. . .	. . .	. . .	. . .	330	. . .	330
Laconia court*	. . .	. . .	. . .	. . .	573	6	579
Liberty*	. . .	. . .	226	. . .	. . .	. . .	226
Light*	. . .	. . .	. . .	. . .	850	. . .	850
Light*	. . .	. . .	. . .	. . .	. . .	102	102
Linden*	. . .	. . .	. . .	1,278	16	. . .	1,284
Linwood road†	. . .	. . .	. . .	. . .	204	. . .	204
Linwood*	. . .	. . .	. . .	. . .	100	. . .	100
Lovett place*	. . .	. .	. . .	. . .	24	. . .	24
Lyman*	. . .	. . .	. . .	. . .	680	. . .	680
Madison	. . .	. . .	. . .	. . .	. . .	150	150
Myrtle*	. . .	. . .	. . .	. . .	96	. . .	96
Nahant*	. . .	. . .	. . .	. . .	570	. . .	570
Nahant-st. pl.*	. . .	. . .	. . .	487	. . .	. . .	487
Newhall*	. . .	. . .	. . .	1,788	188	. . .	1,976
Northern avenue*	. . .	. . .	. . .	. . .	500	. . .	500
No. Federal*	306	. . .	. . .	. . .	. . .	. . .	306
No. Franklin*	. . .	. . .	. . .	. . .	855	. . .	855
Pinkham place*	. . .	. . .	. . .	. . .	. . .	221	221
Rollins avenue	. . .	. . .	. . .	. . .	630	. . .	630
Sea*	. . .	1,110	. . .	24	32	. . .	1,166
Spenser*	. . .	. . .	1,358	. . .	36	. . .	1,394
State road	. . .	1,973	. . .	. . .	. . .	. . .	1,973
Summer*	. . .	. . .	470	. . .	9	. . .	479
Tracy avenue	. . .	. . .	. . .	. . .	407	. . .	407
Walnut*	1,357	. . .	. . .	. . .	. . .	. .	1,357
Washington*	. . .	. . .	. . .	1,060	74	. . .	1,134
	1,663	3,083	5,660	6,178	9,159	719	26,462

	MILES.	FEET.
*Total length relaid	3	4,908
†Total length extended		1,193
Total length new		2,350
Total length of system	139	1,123
Total length in Swampscott		1,788
Total length in Saugus	20	1,135

SUMMARY OF STATISTICS.

FOR THE YEAR ENDING DECEMBER 31, 1907.

In form recommended by the New England Water Works Association.

LYNN WATER WORKS, LYNN, ESSEX CO., MASS.

GENERAL STATISTICS.

Population by census of 1905,	
Lynn,	77,000
Saugus,	6,250
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and river
Mode of supply,	Pumping to reservoir

PUMPING STATISTICS.

1. Builders of Pumping Machinery,
   E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   a. Kind, soft.
   b. Brand of coal used, Georges Creek.
   c. Average price of coal per gross ton, delivered, $4.35.
   d. Percentage of ash, 11.87.
   e. Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,430,800	169,500	6,300

TABLE VIII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1907.

WHERE LAID.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	Total.
Amity*	...	...	...	656	7	...	663
Avon*	...	...	...	...	75	...	75
Avon*	...	...	...	...	173	...	173
Berkeley*	...	...	...	153	...	...	153
Birch*	...	...	...	...	84	...	84
Blake*	...	...	...	...	...	156	156
Burns*	...	...	258	...	16	...	274
Collins*	...	...	...	...	650	...	650
Colonial avenue	...	...	...	...	1,175	...	1,175
Electric place†	...	...	...	...	12	...	12
Essex*	...	...	3,348	74	274	18	3,714
Ezra†	...	...	...	...	402	...	402
High*	...	...	...	658	6	...	664
Holyoke*	...	...	...	...	336	...	336
Laconia court*	...	...	...	...	573	6	579
Liberty*	...	...	226	...	...	...	226
Light*	...	...	...	...	859	...	859
Light*	...	...	...	...	...	162	162
Linden*	...	...	...	1,278	16	...	1,284
Linwood road†	...	...	...	...	204	...	204
Linwood*	...	...	...	...	100	...	100
Lovett place*	...	...	...	...	24	...	24
Lyman*	...	...	...	...	686	...	686
Madison	...	...	...	...	...	156	156
Myrtle*	...	...	...	...	96	...	96
Nahant*	...	...	...	...	570	...	570
Nahant-st. pl.*	...	...	...	487	...	...	487
Newhall*	...	...	...	1,788	188	...	1,976
Northern avenue*	...	...	...	...	500	...	500
No. Federal*	306	...	...	...	...	...	306
No. Franklin*	...	...	...	...	855	...	855
Pinkham place*	...	...	...	...	...	221	221
Rollins avenue	...	...	...	...	630	...	630
Sea*	...	1,110	...	24	32	...	1,166
Spenser*	...	...	1,358	...	36	...	1,394
State road	...	1,973	...	...	...	...	1,973
Summer*	...	...	470	...	9	...	479
Tracy avenue	...	...	...	...	497	...	497
Walnut*	1,357	...	...	...	...	...	1,357
Washington*	...	...	...	1,060	74	...	1,134
	1,663	3,083	5,660	6,178	9,159	719	26,462

	MILES.	FEET.
*Total length relaid	3	4,998
†Total length extended		1,193
Total length new		2,350
Total length of system	139	1,123
Total length in Swampscott		1,788
Total length in Saugus	20	1,135

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1907.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population by census of 1905,	
Lynn,	77,000
Saugus,	6,250
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and river
Mode of supply,	Pumping to reservoir

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a*. Kind, soft.
   - *b*. Brand of coal used, Georges Creek.
   - *c*. Average price of coal per gross ton, delivered, $4.35.
   - *d*. Percentage of ash, 11.87.
   - *e*. Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,430,800	169,500	6,300

	Loretz.	Leavitt.	Auxiliary.
4. [Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,			
4*a*. Amount of other fuel used,			
5. Total equivalent coal consumed for the year =(3)+(4), in pounds,	3,430,800	169,500	6,300
6. Total pumpage for the year, in gallons, with allowance for slip,	2,113,149,500	127,362,100	1,796,575
7. Average static head against which pumps work, in feet,	151.86	147.56	
8. Average dynamic head against which pumps work, in feet,	153.73	148.07	
9. Number of gallons pumped per pound of equivalent coal (5),	615.9	751.4	285.1

10. $$\text{Duty}=\frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5).}}$$

Loretz.	Leavitt.
78,969,520	92,790,520

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

11. Per million gallons pumped,	$9.00
12. Per million gallons raised one foot (dynamic),	$.058

FINANCIAL STATISTICS.

RECEIPTS.			EXPENDITURES.		
From meter rates	$152,347.41		Maintenance	$164,373.22	
From fixture rates	125,521.04		Interest	68,215.00	
			Sinking funds	42,000.00	
Total water rates		$277,868.45	Rebate to Saugus	10,522.96	
From other sources		16,789.12	Construction	4,232.85	
Balance from 1906 construction		1,336.86	Balance to 1908	6,650.40	
		$295,994.43			$205,994.43

DISPOSITION OF BALANCE, TO CONSTRUCTION, 1907.

O.	Net cost of works to date, ...	$2,966,119.73
P.	Bonded debt at date, ...	1,778,500.00
Q.	Value of Sinking Fund at date, ...	502,277.31
R.	Average rate of interest, .03¾ per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1. Estimated population at date,	85,300
2. Estimated population on lines of pipe,	85,300
3. Estimated population supplied,	85,300
4. Total consumption for the year (gallons),	2,195,586,625
5. Passed through meters (gallons),	750,000,000
6. Percentage of consumption metered,	34 per cent.
7. Average daily consumption in gallons,	6,015,306
8. Gallons per day to each inhabitant,	70.52
9. Gallons per day to each consumer,	70.52
10. Gallons per day to each tap,	418
11. Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$75.00
12. Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$106.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1. Kind of pipe,	Cement-lined, and cast-iron.
2. Sizes,	From 36 to 4 inch.
3. Extended during year (feet),	1,193

FINANCIAL STATISTICS.

RECEIPTS.			EXPENDITURES.		
From meter rates	$152,347.41		Maintenance	$164,373.22	
From fixture rates	125,521.04		Interest	68,215.00	
			Sinking funds	42,000.00	
Total water rates		$277,868.45	Rebate to Saugus	10,522.96	
From other sources		16,789.12	Construction	4,232.85	
Balance from 1906 construction		1,336.86	Balance to 1908	6,650.40	
		$295,994.43			$205,994.43

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2. Estimated population on lines of pipe,	85,300
3. Estimated population supplied,	85,300
4. Total consumption for the year (gallons),	2,195,586,625
5. Passed through meters (gallons),	750,000,000
6. Percentage of consumption metered,	34 per cent.
7. Average daily consumption in gallons,	6,015,306
8. Gallons per day to each inhabitant,	70.52
9. Gallons per day to each consumer,	70.52
10. Gallons per day to each tap,	418
11. Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$75.00
12. Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$106.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1. Kind of pipe,	Cement-lined, and cast-iron.
2. Sizes,	From 36 to 4 inch.
3. Extended during year (feet),	1,193

4. Discontinued during year (feet),	None.
5. Total now in use (miles),	139
6. Cost of repairs per mile,	$60.00
7. Number of leaks per mile,	.075
8. Length of pipes less than 4 inches diameter (miles),	
9. Number of hydrants added during year	30
10. Number of hydrants (public and private), now in use,	1,017
11. Number of stop gates added during year,	50
12. Number of stop gates now in use,	1,107
13. Number of stop gates smaller than 4-inch,	70
14. Number of blow-offs,	67
15. Range of pressure on mains (pounds),	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	18,030
19. Discontinued (feet),	800
20. Total now in use (miles),	1 12
21. Number of service taps added during year,	450
22. Number now in use,	14,170
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	432

26. Number now in use,	5,085
27. Percentage of services metered,	36 per cent.
28. Percentage of receipts from metered water (B + C),	50 per cent.
29. Number of motors and elevators added,	1
30. Number now in use,	5

THE PUBLIC WATER SUPPLY OF LYNN.

Quantity and Quality Available and Possible Plans for Enlargement and Improvement.

The controlling facts in our water supply conditions to-day are these:—

1. The supply available from our four ponds, Breed's, Birch, Walden and Hawkes, in a dry year is about 4,000,000 gallons per day.

2. The consumption of water in Lynn and Saugus at present and as estimated for the future is as follows:

Year.	Population.	Consumption.
1907	85,000	6 0 Million gals. per day
1910	90,000	6.1 " " "
1915	109,500	7.6 " " "
1920	124,000	9.2 " " "
1925	139,000	11.0 " " "

3. The difference between what our four ponds will give and what we use, now comes from Saugus river and it is evident that we must continue to use Saugus river or get some other supply.

4. Saugus river drains the towns of Wakefield and Reading and is polluted. Trouble from the pollution has so far been avoided as it has been possible to store the water in Walden pond a long enough time to allow all disease germs to die, before using it.

5. Hawkes and Birch ponds are liable to pollution from the considerable population on their water-sheds. All the ponds may be polluted by the many persons who tramp over the sheds and by the wash of filth from the roads. Careful policing will reduce the danger but with the growth of the city it will greatly increase.

6. The quality of the water from the ponds, though not such as to have caused disease is frequently not satisfactory because:—

   It contains much vegetable matter.
   It is brownish instead of nearly white.
   It is now and then infested by growths of microscopic organisms which give it very bad taste and odors.

These were the conditions which confronted the Water Board when they took up the study of the problem in the spring of 1907. All of the possible plans for getting an ample supply of water of good quality have been most carefully considered. Water from the Metropolitan system cannot now be obtained at reasonable cost, considering what has been spent on our ponds during the past few years, which would mainly be of no value to the Metropolitan system. The work of the board's engineer, Mr. William S. Johnson, soon showed that Beaver Dam brook in Lynnfield, previously considered, could not be used to advantage because it was too low an elevation to flow by gravity to the present ponds without the building of expensive conduits, while the large areas of swamps through which the brook flows, together with danger of pollution from Lynnfield, made the character of the water objectionable. Martin's brook and the Ipswich river were carefully studied. The cost of bringing this water to Lynn would be large and the water, while not polluted to so great a degree as the Saugus, is in many respects of less desirable quality than the water of the Saugus river, being of very high color and containing much vegetable matter and would not be suitable to use without purification. As a future supply the Ipswich river will be needed, but it can not be economically utilized at present. It therefore became apparent that the best plan was to find a way to make the present sources satisfactory.

Scheme A. Purification by Storage.

The largest part of the time and study which we have given the problem has been devoted to finding a way to make the water satisfactory without filtration. The plans of the Water Board for some years have contemplated accomplishing this by long storage. Most careful investigations of our engineer showed conclusively, that if the water of Saugus river was stored for four months all disease germs possibly in it, would die, and the water would be safe to use. Surveys showed that the water of Pillings pond could be run by gravity into either Walden or Hawkes ponds and that a conduit for this purpose could be easily built. With this additional supply the amount of water needed from Saugus river would be considerably lessened, so that while the city was being supplied from Breed's, Birch, Hawkes and Pillings ponds, water could be pumped into Walden pond from a new station at Montrose discharging into the Pillings-Walden conduit ,without passing through Hawkes as it now must, and could remain there more than four months, before the exhaustion of the other ponds made it necessary to use it. In this way therefore we could get ample time for storage to insure a safe water for a good many years to come.

The danger of pollution on the water-sheds of the five ponds which would then belong to our system would be prevented by securing the removal of camps, piggeries, buying some pieces of land, building sewers or vaults to take care of the drainage of houses, barns, etc., and by a most careful and constant policing of the water-sheds at all times. In this way a water which would be reasonably safe could be secured and the quantity obtainable, using Saugus river to its full capacity, would be sufficient to carry the city nearly to the year 1925.

Vegetable Matter and Color.

There are many swamps on the water-sheds of our ponds. The rain water stands in the swamps for long times and flows only slowly to the ponds. This results in the water taking up a good deal of vegetable matter, such as leaves, moss, etc., which remains in suspension and is carried into the ponds by the brooks. This at times gives a vegetable taste to the water and accounts for the foreign matter frequently found in it if it is allowed to stand for a time. It also furnishes food for the organisms which develop at certain periods in most objectionable quantities.

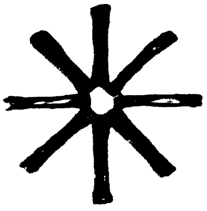
To get rid of this trouble it would be necessary to drain the swamps by the digging of frequent and deep ditches through them. This would let the rain water flow quickly to the ponds and prevent the soaking which now goes on.

The brownish color in our water is also due to the passage of the water through the swamps; the color in roots and leaves is taken up by the water just the same as the color is taken from tea in steeping. The thorough draining of the swamps would therefore not only largely remove the vegetable matter but would also bring a much whiter water into the ponds where bleaching action would further improve it.

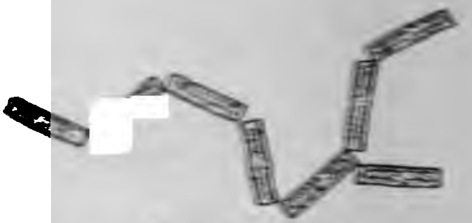
Saugus river water is also of very high color at times and with the present arrangement it is necessary to dam the river and overflow many acres of the Lynnfield meadows to raise it sufficiently to let it flow by gravity to Hawkes pond. The pumping station proposed at Montrose to lift the water to Walden pond would make flooding unnecessary, thus preventing the opportunity for the water to soak up a great quantity of vegetable matter from the meadows and would further make it possible to take the river water at times when the color was least objectionable.

Organisms.

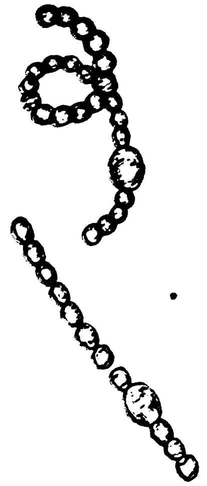
Nearly all fresh water ponds are liable at times to growths of microscopic organisms. These organisms come and go without warning, sometimes remaining but a short time and then suddenly disappearing, at other times continuing for weeks. There is no known way of avoiding them or of controlling them safely. These organisms are both animal and vegetable, and there are many curious forms of them, some of those most commonly found in our ponds are shown in the following cuts, greatly magnified. Dinobryon, an animal form, is the one which gave the bad taste and odor in the water last fall. For several weeks there were in Walden pond over a thousand of these per cubic centimeter of water or 230,000 in an ordinary glass of water.



ASTERIONELLA



TABELLARIA



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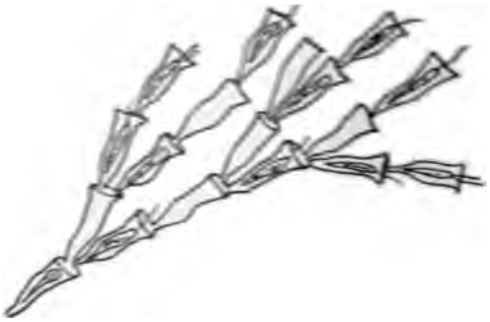


DINOBRYON

The best present information indicates that these organisms are not dangerous to health, but they do often cause exceedingly disagreeable tastes and odors in the water as delivered from the house taps. This trouble comes partly from matter given off by the organisms and partly from their decay. Harmful results come from the fact that people will not use the water when this trouble exists and are driven to other sources of supply, which may contain actual pollution. Further, all sorts of small filters are used giving but imperfect relief and entailing a good deal of cost in the aggregate to the citizens.

To get over this trouble as far as possible it was proposed to thoroughly clean out or cover with gravel, the deep mud which exists in the bottoms of Breed's, Birch and parts of Walden ponds. This mud furnishes conditions most favorable for the growth of the organisms, so that its removal or covering was necessary if serious trouble from this cause is to be avoided. Even with ponds having clean bottoms and with water-sheds clean and swamps drained, trouble from organisms would still be sure to occur now and then, for they will develop in ponds under such conditions, though less frequently than with muddy bottoms and swampy sheds.

It was therefore necessary to go still further and plan for large additional mains to connect each pond independently with the pumping station,—all the water coming from the upper ponds having to go through Birch pond at present. This would make it possible to cut out a pond in which there was an objectionable growth of organisms. Usually these growths would not occur in all the ponds at the same time, though now and then this would happen.

Result and Cost.

By storing and policing, the water would be made safe; by cleaning the sheds and draining the swamps and improving the method of taking Saugus river vegetable matter and color would be improved; by cleaning the bottoms of the ponds and laying additional mains, trouble from organisms would be greatly reduced. A practically safe water, generally satisfactory in taste, odor and color would be obtained. The water would still be rather inferior to that supplied by the Metropolitan system, because our water-sheds are flatter than those on most of the Metropolitan sources and therefore less favorable for the collection of a clear and good water. Further it would be increasingly difficult to maintain the freedom from pollution with the certain increase of population on the water-sheds and with the larger use of the woods reservations with the growth of the city and it would be impossible to prevent the washing into the reservoirs of considerable quantities of filth from the roads.

When the State Board of Health developed the Metropolitan water supply system they adopted exactly this method of securing a satisfactory water. The bottoms of their storage basins were cleaned at large expense, swamps were drained, sewers, sewage purification systems, and vaults built, the objectionable water of certain brooks reaching the basins was locally filtered and finally constant policing was provided for the water-sheds. Their storage basins are large, the newer ones are really lakes. They are mainly well removed from large populations. Conditions were favorable for the carrying out of this method and a good water results.

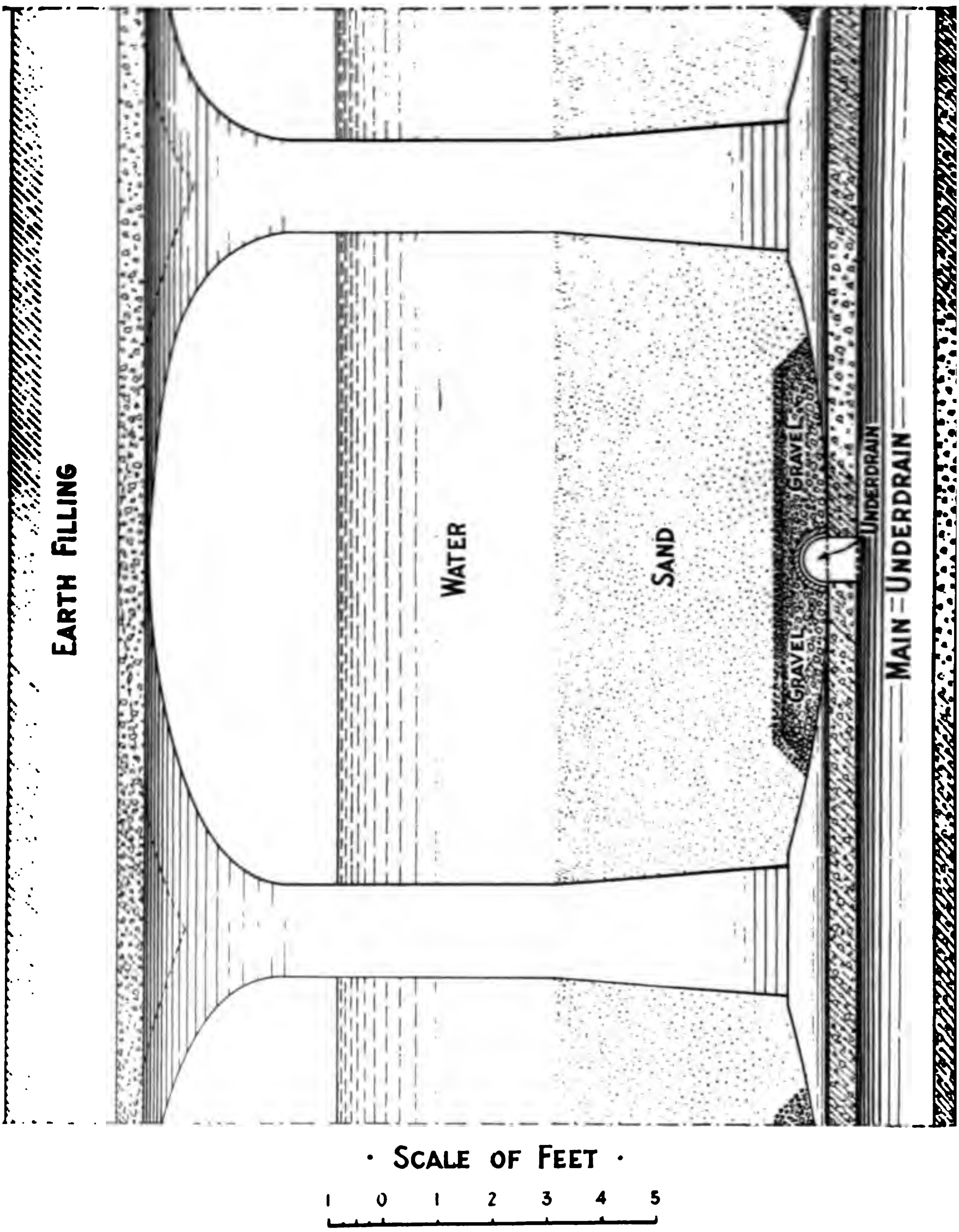
Our Scheme A is therefore the plan on which the Metropolitan supply was developed and still maintained. Mr. Johnson and the members of the board studied out every detail of this plan with the greatest care. We had for a considerable time the expectation that it would prove a satisfactory scheme for a number of years to come. When, however, all data were available, and all figures finally made up, it was found that the total cost would be $383,000, while to thoroughly filter the water would cost $297,000. The estimates of the two plans were made on exactly the same basis and are therefore comparable even if individual items should be in error. A careful study showed that nothing of moment could be omitted from Scheme A and get the results necessary. The still more extensive storage plans originally contemplated would be very much more expensive and would not give greatly better water. These plans would require the further raising of Walden pond dam, very likely necessitating its general rebuilding, and probably also would require some enlarging of one at least of the other storage reservoirs. There was therefore no justification for going beyond the limit of Scheme A.

The board therefore had two complete plans before them. The "Purification by Storage" plan, after most painstaking study proved much more expensive than to filter, while the water which was thus obtained would not be as good as that resulting from filtration. Again filtration was evidently bound to be necessary later when the population in and near the water-sheds increased. There was therefore absolutely but one reasonable conclusion possible, namely, to adopt filtration now.

Scheme B. Purification by Filters.

Slow sand filters will do all the work necessary with Lynn waters and are therefore preferable to chemical filters on account of their greater simplicity and more "fool proof" qualities and the lesser cost of running them. Filter beds having a surface of three acres are advised. These would be divided into six sections so that one or two beds could be in process of cleaning while the remainder of the beds were doing the work. The sand filter is a very simple device which merely makes it possible to do artificially what is going on all the time in nature, where the rain water is constantly passing down through the sand and gravel and coming out again in wells and flowing springs. The purification is effected without the use of any chemicals, the only action being that taking place naturally when water passes slowly through soil.

The filters proposed would have a depth of about four feet of sand, the water from the ponds would be brought on top of the sand beds by pipes and would pass slowly down through the sand and be collected by the underdrains which would carry it to a small clear water basin and it would then flow by gravity to the pumps. The filters would be entirely enclosed in a concrete masonry structure covered to prevent trouble from freezing in winter. The pumps would force the water to the present reservoir just as they now do. Following is a section taken through


EARTH FILLING
WATER
SAND
GRAVEL
GRAVEL
UNDERDRAIN
MAIN-UNDERDRAIN
· SCALE OF FEET ·
1 0 1 2 3 4 5

a sand filter showing the underdrains which take away the filtered water, the sand layer, and the raw, or pond water on top.

After use of several weeks, the time depending on the character of the water, a layer of very fine material collects on top of the sand and the water is unable to pass this readily. Then the filter has to be cleaned and this is done by removing this fine stuff, about a quarter inch of sand being removed each time. This sand is washed and returned to the beds. Thus the process goes on indefinitely.

The filter does exactly what the natural sand and gravel banks do to all rain water which passes through them. All material in suspension, which makes the water turbid and dirty is strained out and disease germs and other impurities too minute to be caught by the straining action are thoroughly *changed* by oxidation, or slow burning up, so that the water resulting is absolutely free from objectionable matter. The color of the water is also considerably improved.

In the processes of nature, similar changes are all the time going on, and the objectionable refuse of life is being changed into harmless and useful forms. The fertilizer on the field and the low grade food of the pig are homely but common illustrations of the change of repulsive matter to acceptable foods for man. In an entirely similar and equally natural way the filter absolutely removes or changes all that is dangerous and objectionable in the water, and pure agreeable water results. The process is sure, the result is satisfactory, and all is done by a simple adaptation of one of the most universal actions in nature.

Filters Not Experimental.

Filtration is now used in many places, from large cities to small towns. New York is planning to build an enormous sand filter plant to purify the supply for the city with its population in 1900, of 3,437,000. After a most careful study by the best experts in the country, this course has been advised rather than to clean the bottoms of the new reservoirs. Springfield, Mass., is also soon to filter the water from the mountain reservoirs which will furnish the new supply for the city. Following is a list showing a number of places where filters are now in use, or soon to be provided.

Cities in the United States Having a Population of more than 25,000 in which the Water Supply is Filtered.

	Population 1900.	Capacity of Filters in Gallons per day.
Philadelphia, Pa.	1,293,697	420,000,000
Cincinnati, Ohio	325,902	112,000,000
Pittsburg, Pa.	321,616	100,000,000
New Orleans, La.	287,104	44,000,000
Washington, D. C.	278,718	87,000,000
East Jersey Water Co.	250,000	32,000,000
Hackensack Water Co.	225,000	24,000,000
Louisville, Ky.	204,731	37,500,000
Providence, R. I.	175,597	24,000,000
Indianapolis, Ind.	169,164	24,000,000
Denver, Col.	133,859	30,000,000
Toledo, Ohio	131,822	30,000,000
Columbus, Ohio	125,560	30,000,000
New Haven, Conn.	108,027	15,000,000
St. Joseph, Mo.	102,979	11,000,000
Albany, N. Y.	94,151	17,000,000
Atlanta, Ga.	89,872	6,000,000
Reading, Pa.	78,961	5,750,000
Lawrence, Mass.	62,559	5,000,000
Charleston, S. C.	55,807	5,000,000
Kansas City, Kan.	51,418	6,500,000
Harrisburg, Pa.	50,167	12,000,000
Yonkers, N. Y.	47,931	7,500,000
Norfolk, Va.	46,624	8,000,000
Youngstown, Ohio	44,885	10,000,000
Binghamton N. Y.	39,647	8,000,000
Augusta, Ga.	39,441	6,000,000
Birmingham, Ala.	38,415	6,000,000
Little Rock, Ark.	38,307	5,500,000
Terre Haute, Ind.	36,673	9,000,000
Dubuque, Ia.	36,297	9,000,000
Quincy, Ill.	36,252	4,000,000
Elmira, N. Y.	35,672	7,000,000
Davenport, Ia.	35,254	7,000,000
Chester, Pa.	33,988	4,000,000
York, Pa.	33,708	4,000,000
Knoxville, Tenn.	32,637	4,500,000

	Population 1900.	Capacity of Filters in Gallons per day.
Superior, Wis.	31,091	5,000,000
Chattanooga, Tenn.	30,154	9,000,000
East St. Louis, Ill.	29,655	11,000,000
Newcastle, Penn.	28,339	4,000,000
Oshkosh, Wis.	28,284	2,000,000
Lexington, Ky.	26,369	3,500,000
Joplin, Mo.	26,023	3,500,000
Cedar Rapids, Ia.	25,656	2,500,000

This shows that there has already been large experience with filters in this country.

The table includes both slow sand and chemical filters.

Dangers in Filters.

The only possible danger in the use of filters is in the ignorance or carelessness of the operators. In the simple slow sand filters, however, there is not much chance of serious trouble occuring even with unintelligent or careless management. In the Scheme A "Purification by Storage," safety would entirely depend on the constant, careful and efficient watching of watersheds and a mistake or omission might with the increasing population on the sheds, lead to trouble. Further, the opening of a wrong gate letting down polluted water before it had been stored sufficiently to become purified might easily cause an epidemic. The filter, therefore, does not necessarily depend more on careful handling than do other plans on which we have been accustomed to depend and do still depend.

In our case, however, the water which it is proposed to filter is the same water which has been used by the city for many years without filtration and which has as yet caused no serious epidemics. It is not proposed to introduce any new supply until the present sources are exhausted, and the water which will be furnished to the city will be the same water as supplied at the present time, with the objectionable features removed.

We shall moreover in Lynn have a *double safeguard*, for even with filtration the plan contemplates a storage of the water in the ponds for several months before it reaches the filters, thus practically all of the disease-bearing germs would die before the filtering began. This is possible on account of our large ponds and the fact that waters coming from either the Saugus or Ipswich rivers will pass slowly through several of the ponds on the way to the filters. This is a specially favorable condition and gives us a factor of safety which many communities using waters directly from polluted rivers do not have. Our filters will therefore make absolutely sure that disease germs from the Saugus, or Ipswich river later, possibly not removed by the storage are taken out, that pollution getting into our own ponds is rendered harmless and that organisms causing offensive tastes and odors are entirely removed. A clear, clean water will therefore be surely obtained and this can go with certainty year in and year out.

Water Not Flat.

It has been stated that filtered water will be flat like distilled water. This is a wrong impression, but it must be kept in mind that the process is a natural one, and the resulting water will have exactly the same characteristics as a good well water or the water from a clear mountain spring. The vegetable taste will be gone, bad odors and tastes will never occur and a wholly agreeable water, soft, safe and clean will be always available, and within the reach of every citizen.

This and many other similar objections to filtered water will disappear if the real work of the filter is fully grasped. All our water falls from the clouds, vegetable matter and the wastes from man and animals get into it to a greater or less extent. The filter takes this, what we might call adultrated water, as its raw stock and simply *removes* all the stuff which does not belong in it; water, plain water, simply freed from all foreign impurities but with no desirable qualties lost, results. The perfect removal of the impurities is done just as naturally and to all purposes as thoroughly as when our great rivers, with their burden of filth roll into the sea, to be taken up in evaporation by the winds, to lose all their impurities and to fall again from the clouds as the pure rain water which we have always looked at as above all suspicion, our standard of what is good.

Cost of Filters.

The filters proposed and all attached work, a low lift pump at Montrose to avoid flooding the meadows, together with the draining of swamps necessary to improve the color of the water, will cost about $297,000. The cost of operating them under present conditions will be about $6,000 per year. The cleaning of the pond bottoms, the laying of new mains from the ponds to the pumping station, and considerable work on the water-sheds all become unnecessaay when the water is to be filtered. Filtering is, therefore, absolutely the cheapest and the best thing to do. The Water Department is earning sufficient money to pay interest and sinking fund charges and all costs of operation without any additional burden on either the tax payer or the water consumer.

Conclusion.

The ideal water supply is one which is absolutely free from pollution and does not require purification either by storage or filtration. To find such a supply in eastern Massachusetts, of sufficient capacity for the requirements of a city like Lynn is an absolute impossibility. There is no water-shed of sufficient size to furnish Lynn with water, which does not contain a considerable population from which more or less drainage finds its way into the streams, as well as the drainage from streets, from cemeteries, etc. The only source from which the city of Lynn could obtain water of better quality than that furnished by the present sources is the Metropolitan water district. The Ipswich river and all other large streams in the vicinity of Lynn receive the drainage from a large population, from factories, from numerous cemeteries and the wash from many roads.

With the exception of the Metropolitan district, therefore, there is no source to which we can turn for a better supply than our present sources will furnish; and by filtration of the present sources a water can be obtained which will be of much better quality than the water now supplied to the Metropolitan district at a much less cost than the cost of obtaining water from the Metropolitan works.

If a thoroughly satisfactory water could be obtained by the methods of Scheme A, that is by storage, it might be reasonable to let preference decide the matter, even paying considerable more for the storage plan if all strongly desired it, rather than filtration. Our water-sheds are however of low lying character, the Ipswich being especially flat and giving a vegetable and highly colored water, so that the quality of supply obtainable by any "purification by storage" plan however complete and expensive would not give as good water as can be obtained by filtration. Further the growth of population would make it increasingly difficult to guard against actual pollution. The simple, natural filter therefore, remains as the only complete and permanent solution for Lynn's water problem, and used in connection with storage as is contemplated, an absolutely safe and otherwise satisfactory water will be produced.

Mr. Johnson's report with maps, clearly explaining the two general schemes and the work done follows.

THOMAS CAMPBELL, 2d, *President*,
E. E. PINKHAM,
HARRY A. SWETT,
E. V. FRENCH,
JOHN J. HEYS,
Public Water Board.

REPORT OF WILLIAM S. JOHNSON.

BOSTON, December 28, 1907.

Public Water Board, Lynn, Mass.:

GENTLEMEN,—In accordance with your instructions, I have made a thorough study of the present sources of water supply of the city of Lynn with a view to determining the best method of improving the quality of the water and have investigated other possible sources of supply which might be used in connection with the present sources. Detailed results of the investigations are submitted in a full report together with plans showing the various studies which have been made. The following is a brief summary of the conclusions reached.

Supply from Metropolitan District.

If it could be shown to be for the best interests of the city of Lynn to enter the Metropolitan District at the present time, this could undoubtedly be accomplished. Should Lynn be supplied from these works it would be necessary to construct a pipe line from Malden into the city at an estimated cost of more than $300,000.

If the city of Lynn had entered the Metropolitan District in the beginning and had paid a portion of the assessment each year, being supplied from its own works, as in the case of the city of Newton and the town of Hyde Park, its aggregate annual assessments would now have amounted to over $80,000. It is certain that in justice to other portions of the district the city would be compelled to pay this amount for the privilege of entering the district at the present time.

The annual assessment, if the city should take its entire supply from the district would now be in the vicinity of $80,000 per year.

To offset this in part, it would be unnecessary to maintain the present reservoirs and pumping station, which would mean a saving of perhaps $20,000 per year, making the annual cost about $60,000 per year greater than the cost of maintaining the present works. This is very much in excess of the cost of obtaining an ample supply from any of the other sources investigated and of filtering the entire supply while the quality of the water supplied by the Metropolitan Works would be inferior to that obtained from the Lynn sources after suitable filtration.

Ipswich River and Martin's Brook.

Authority was granted to the city of Lynn in 1901 to take a portion of the water of the Ipswich river. At the point where water can be taken under the act the river has a water-shed of about 45 square miles. The water-shed contains a population of about 4,000, including the villages of Wilmington and North Reading. Near the head waters of the river in the town of Wilmington there is a tannery which discharges large quantities of foul wastes into the stream.

The principal tributary of the river is Martin's brook which enters it about 3.5 miles above the lowest point where water may be taken. The brook has a water-shed of 12.4 square miles which contains a small and scattered population. The main portion of the Ipswich river would not furnish water which could be used without purification in some way and in this respect it is not materially different from the Saugus river. The water of Martin's brook could be kept free from pollution at a reasonable expense.

The color of the water of the Ipswich river is higher than the color of the water of the Saugus river and the water of Martin's brook is even higher than the water of the main stream, so that without decolorization in some way the water of either stream would be of very unsatisfactory quality.

Investigations which have been made show that to convey water from Martin's brook into the present ponds, either by gravity or by pumping would be a very expensive undertaking and the result would not be satisfactory. To get the water from the main stream of the Ipswich river to the present ponds would be less expensive than to take the water from Martin's brook; but in this case, as well as in the case of the use of the Saugus river, the water would have to be purified before it could be used. Without purification, the Ipswich river would not furnish water of satisfactory quality. With purification the Saugus river would be likely to furnish more satisfactory water than the Ipswich river and at a much less cost.

Beaver Dam Brook and Pillings Pond.

The possibility of using these two tributaries of the Saugus river has been investigated. Beaver Dam brook furnishes water of little better quality than the water of Saugus river and the expense of securing water from this stream would be large in comparison with the quantity which would be obtained. Pillings pond, the other tributary, could be made to furnish water of much better quality than any of the present sources of supply, and it is possible to get the water into the ponds by gravity at a small expense.

The yield of Pillings pond, together with the ponds which constitute the present sources of supply, would in a very dry year be no greater than the present consumption of water in the city. It would still be necessary, therefore, if Pillings pond should be used, to use the water of the Saugus river at times.

Improvement of Present Sources.

The investigations which have been made show clearly that it is for the best interests of the city to improve the present sources of supply rather than to attempt at the present time to secure a new supply from some other source. There are but two feasible methods of doing this, which are outlined in the following schemes.

Scheme A.

The ponds which constitute the present sources of supply can be improved so as to furnish water which will be of fair quality and as safe as any surface water source in the midst of a large population can be. In order to accomplish this without filtration, it would be necessary to drain thoroughly the principal swamps upon the water-sheds, remove or cover with gravel, so far as possible the mud and other organic matter upon the bottom of the ponds, construct sewers and drains to remove the sewage and street wash from the most thickly settled portions of the water-sheds; construct water-tight vaults where vaults are necessarily situated within a short distance of any stream, purchase land where the most dangerous sources of pollution exist, and maintain a constant and thorough inspection of the ponds and their water-sheds by capable and trustworthy men. Pipe lines should also be constructed so that water can be drawn from any one of the ponds in sufficient quantity to supply the pumps.

The water of the Saugus river cannot be made of satisfactory quality, except by filtration or storage, although its quality can be much improved by ditching the swamps, preventing the direct discharge of sewage into it, and by the sanitary control of the water-shed. If the water should be stored in a reservoir for a sufficient time before being used, it could be made perfectly safe for domestic purposes, and at the same time a portion of the color would be removed.

Studies have been made of the possibility of providing for the storage of Saugus river water in Walden pond for a sufficient time to insure the destruction of all disease germs, but the supply from other sources is so limited that without some supplementary supply, the period of storage during the dry season would be too short for this purpose.

With Pillings pond added to the present ponds enough water would be available during a year of average rainfall to supply the present requirements of the city without the use of any water whatever from the Saugus river. During a very dry year it would be necessary to pump a small quantity from the Saugus river, the quantity increasing each year with the increased use of water in the city. Plans have been made, therefore, for utilizing the water of Pillings pond in connection with the present sources, as follows:

Construct a small intake basin on the Saugus river at a point below the present canal in such a manner that the water will not flood the meadows; erect a 10,000,000 gallon centrifugal pumping plant, electrically operated; lay an 18-inch force main on Lowell street to a point where it would intercept a gravity main from Pillings pond to Walden pond. The main from Pillings pond to Walden pond would be constructed of concrete 36 inches in diameter. At the point where this main crosses Hawkes brook, gates and blow-off would be provided so that the water of Pillings pond could be discharged into Hawkes brook when desirable. The 36-inch pipe from Pillings pond would carry more water than the pond would yield, but this size is recommended since if this scheme is adopted the extension of the supply will be by pumping the water of the Ipswich river from the vicinity of the paper mill at South Middleton into the Pillings pond water-shed, which can be done at a comparatively small expense.

The adoption of this plan, together with the improvements of the pond, and their water-sheds, will give the city a water which will be as safe as it is possible to secure from surface water sources situated near a large population. The water will be highly colored, though not so much as at present. It will have a vegetable taste and color and will be subject to occasional growths of organisms which will make it offensive, but the troubles in this respect will be much less frequent than at present.

The following is an estimate of the cost of construction:

Drainage of swamps	$7,000
Improvement of bottom of ponds	75,000
Pipe line from Hawkes pond to Walden pond pumping station	39,000
Extension of pipe through tunnel above Birch pond . .	9,500
Pipe line around Birch pond	43,500
Pipe line to Breed's	20,000

Intake basin on Saugus river	$5,000
Pumping plant including station	6,000
Gravity main from Pillings pond to Walden pond	65,000
Force main from Saugus river to connect with above gravity main	18,000
Protection from pollution	20,000
Land and water damages	25,000
Total	$333,000
Engineering inspection and contingencies, 15 per cent.	49,950
	$382,950

Plan B.

By filtration the water of the present sources can be made of perfectly satisfactory quality and it is undoubtedly a fact that in common with other cities supplied from surface sources located near a large population, the city of Lynn will find it necessary eventually to filter its water supply, whatever plan is adopted to meet the present requirements.

There are two methods of filtration which might be adopted, the first known as slow sand filtration, which consists in passing water through a bed of sand at a rate from 2,500,000 to 5,000,000 gallons per acre per day. The second known as mechanical filtration, which requires the use of chemicals and sedimentation, after which the water is passed through small filters at the rate of from 100,000,000 to 125,000,000 gallons per acre per day.

Both of these systems of filtration are in common use and both give good results; but, for the city of Lynn, I would unhesitatingly recommend slow sand filters in preference to mechanical filters.

By slow sand filtration all tastes and odors would be removed from the water, and water would be supplied which would be clear, odorless, and in every respect of satisfactory quality except that some of the color would still remain.

The use of a coagulant and settling basin before filtration would insure a practically colorless water, but with slow filtration alone, after improving the water-sheds of the ponds by the drainage of the swamps, a water would be furnished which would have a color very much less at all times than the color of the best water supplied to the city under the present conditions.

The most favorable site for the filters is on the poor farm where there is unoccupied land at such an elevation that the water can be conveyed to it from the ponds by gravity and the filtered water can be conveyed to the Walnut street pumping station by gravity. This is the site selected by the engineer of the State Board of Health and the city engineer of Lynn as a result of the investigations made by them in 1906.

Plans in sufficient detail for reliable estimates have been made for a purification plant consisting of six-half acre filter-beds enclosed in masonry structures, the roofs to be groined arches supported by concrete piers, the filtering material to consist of four feet of sand. The filtered water would be collected in a covered masonry reservoir, located near the filters, from which it would flow to the pumping station by gravity.

The piping necessary to bring the water to the filters and to convey it from the filters to the pumping station would consist of a 36-inch pipe connecting with the present pipes leading from Birch pond to the pumping station and 36-inch pipe from the clear water reservoir to the Walnut street pumping station.

Careful estimates have been made of the cost of constructing the filters and it appears that the six filter-beds having a combined area of three acres, together with the clear water reservoir and all necessary piping would cost $275,000.

Should the water of the present sources be filtered, it would be desirable to drain the swamps upon the water-sheds of the present ponds in order to reduce the excessive color of the water entering the ponds. It would be desirable also to provide for obtaining water from the Saugus river without flooding the great areas of meadows above the canal as is necessary at present. To do this, an inexpensive pumping plant should be installed at Montrose to raise the water from the river to the canal at times when it is desirable to use this source. This could be done at an expense of about $6,000.

The total cost of works for improving the water by filtration would be as follows:

Six one-half acre filter beds complete with all connections, regulating apparatus, etc.	$177,662
Clear water basin	16,897
36-inch C. I. main to filters	23,490
36-inch concrete main to pumping station	20,400
	$238,449
Engineering inspection and contingencies, 15 per cent.	37,717
Land damages	10,000
Drainage of swamps	7,000
Pumping plant at Saugus river	6,000
	$299,166

The distributing reservoir into which the water is pumped is an open basin. When filtered water is exposed to light in such a reservoir organisms grow more rapidly than in unfiltered water and there is a possibility that it may be found desirable to separate a portion of this reservoir so that water will not be stored for so long a time or to cover a section to keep the water from exposure to light. It is likely, however, that this will be found to be unnecessary.

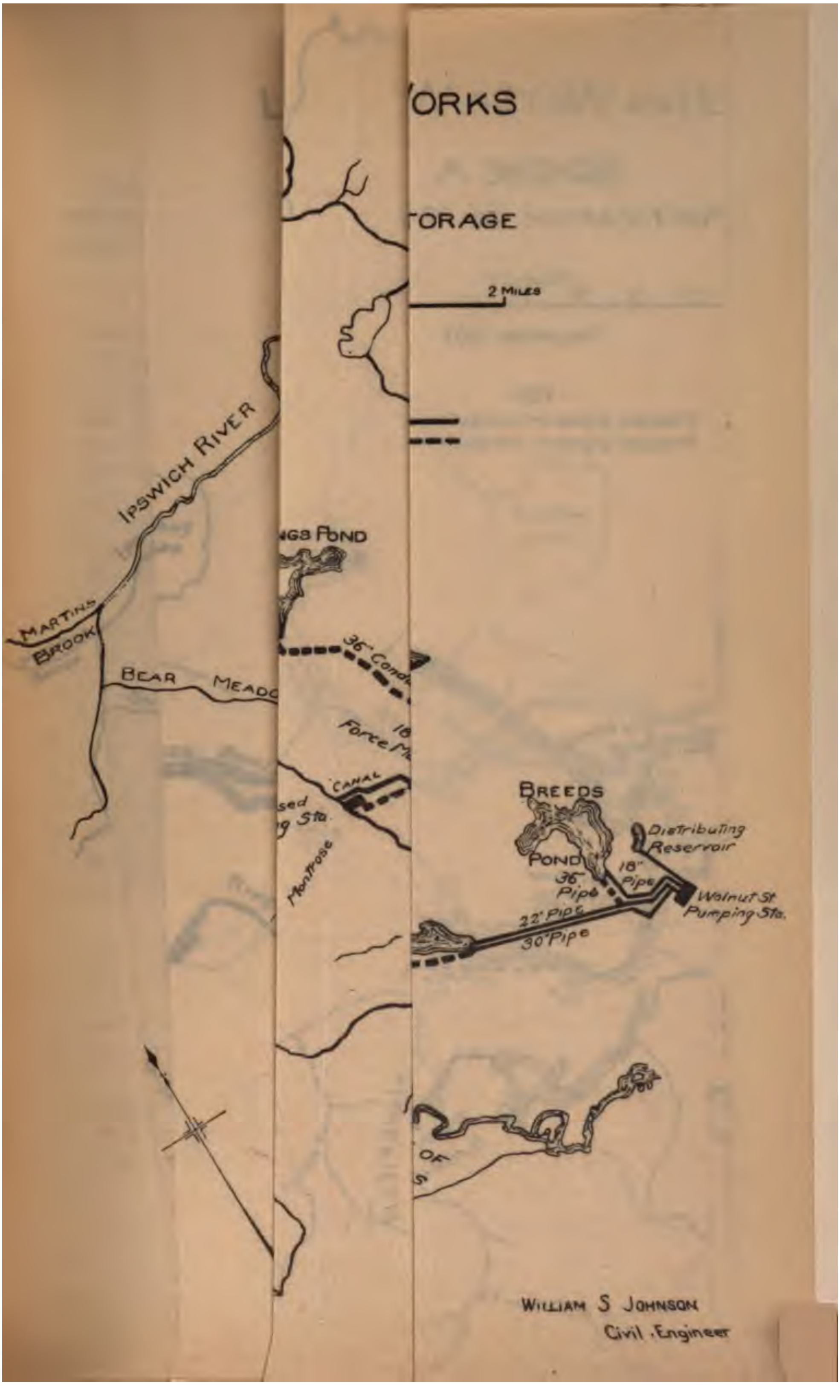
Future Supply.

The development of the present sources by either of the schemes outlined above would provide the city with a sufficient supply of water until about the year 1922. If the town of Wakefield should exercise its rights to take the water of Lake Quannapowitt, the time would be shortened somewhat.

The future supply will evidently come from the Ipswich river and plans have been made of various schemes for taking water from this river when it shall become necessary.

If Scheme A is adopted the best method of taking water from the Ipswich river will be to pump from above the paper mill into Pillings brook.

If Scheme B is decided on, there are several methods of using the Ipswich river which would be perfectly feasible and the selection of the particular method may reasonably be left until the necessity arises.



ORKS
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2 MILES
IPSWICH RIVER
MARTINS BROOK
BEAR MEADO
NGS POND
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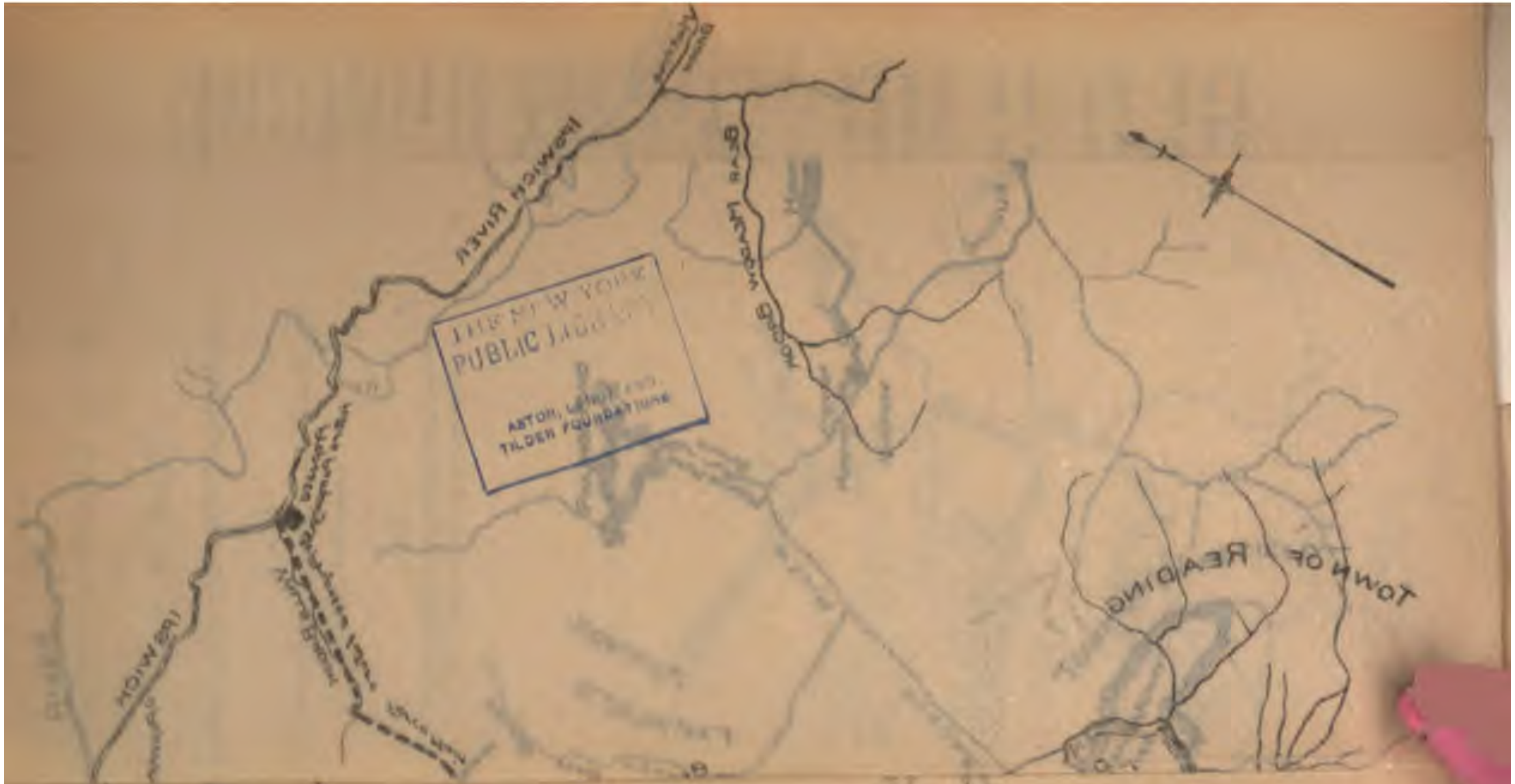
Montrose
BREEDS POND
Distributing Reservoir
18" Pipe
36" Pipe
Walnut St. Pumping Sta.
22" Pipe
30" Pipe
OF
S
WILLIAM S JOHNSON
Civil Engineer


IPSWICH RIVER
IPSWICH
BEAR MEADOW BROOK
TOWN OF READING

With the Ipswich river added to the present sources, the city will have sufficient water to supply its requirements for many years in the future.

Conclusions.

The investigations which have been made show clearly that it is for the best interests of the city to improve the present sources of supply rather than to attempt at the present time to obtain water from a new source. By cleaning up the ponds and their water-sheds, taking Phillings pond and constructing pipe lines from the various ponds to the pumping station at a cost of $383,000, water can be obtained, if the water-sheds are carefully guarded, which will be practically free from disease germs. The water will, however, be colored, will contain a considerable quantity of organic matter and at times will be objectionable, on account of tastes and odors.

By the construction of filters, together with the drainage of swamps and the construction of a pumping plant at Montrose at a cost of $299,000, water can be obtained which will have little color and which will be absolutely clear, tasteless and odorless.

The cost of operating the filter plants will be about $6,000 per year, which is practically the interest and the contribution to the sinking fund required by the extra cost of Scheme A; so that the annual payment required by the city by the two schemes would be practically the same.

Respectfully submitted,

WILLIAM S. JOHNSON.

REPORT OF WILLIAM S. JOHNSON

ON LEAKAGE OF WALDEN POND DAM.

BOSTON, October, 29, 1907.

Public Water Board, Lynn, Mass.:

GENTLEMEN,—In accordance with your request, I have installed measuring weirs below Walden pond dam, with a view to ascertaining the quantity of water lost by leakage from Walden pond and have made frequent observations of the flow over these weirs for a period of nearly three months. I have also established measuring apparatus below the Birch pond dam, to determine the leakage from that pond.

The leakage from Walden pond is not confined to any one point, but the water appears along the foot of the dam throughout practically its entire length. In a few places the water comes out in small streams, but in most cases it simply oozes out, making the soil wet and soggy. The water appearing at the southerly end of the dam is collected in an underdrain about 300 feet long, laid not far from the toe of the slope of the dam. A weir has been constructed at the point where this underdrain discharges into a ditch. Two well-defined streams which collect considerable of the leakage from the northerly end of the dam have also been measured. In order to determine the quantity finding its way through that part of the dam where there is no well defined stream, several small ditches have been dug along the base of the dam to collect the water which oozes out and makes the lower part of the slope soft and springy and the water of each ditch is passed over a weir. A weir has also been constructed on Penny brook at an old dam about 700 feet below Walden pond dam, over which all water which leaks through or around the dam must pass. The brook at this point, however, receives also the natural drainage from a small area tributary to it below the dam, so that the flow at this point would represent beside the leakage a small amount of surface water naturally entering the brook. After rains, the quantity of water entering the brook from the area tributary to it below the dam is a substantial proportion of the flow. At times of dry weather, however, the flow from this water-shed would be very small and the principal part of the flow over the weir at such times would consist of water from Walden pond.

Walden pond has never yet been filled to the high water mark, and at the time the weir was completed the water was 7.5 feet below high water mark. During the time the measurements have been continued the level of the water in the pond has dropped to 13.7 feet below high water.

The largest single leak measured was in the southerly end of the dam. The leakage at this point when the water in the pond was 7.5 feet below the high water level was at the rate of about 2,800 gallons per day. When the level of the water in the pond had gone down about five feet this leak entirely disappeared and no water has flowed over this weir since that time. This was the largest leak measured and was the only one to entirely disappear with the lowering of the water in the reservoir.

The underdrains which collect the water from the southerly end of the dam has discharged from 99,000 to 28,000 gallons per day, the former amount being discharged when the water in the pond was at its highest elevation and the latter when the water was at its lowest stage. This represents the leakage from about one-quarter of the total length of the dam.

The two streams at the northerly end of the dam discharged 17,600 and 4,600 gallons per day, respectively, at the beginning of the measurements, and 10,200 gallons and 1,900 gallons at the lowest stage of the water.

The four small ditches dug at the toe of the slope each discharged from 1,600 to 2,600 gallons per day when the water was 11.5 feet below high water mark and from 700 to 1,100 gallons per day when the water was 17.7 feet below high water.

The weir on the brook 700 feet below the dam discharged in the beginning 418,000 gallons and at the lowest point reached by the reservoir the discharge was diminished to 239,500 gallons. The flow over this weir, as before stated, was affected to some extent by the rainfall, but at the beginning of the test in August the weather had been unusually dry for some time, so that the water flowing over the weir was derived largely from Walden pond. When the lowest flow was obtained in the middle of September there had been considerable rain, so that it is likely that the flow might have been somewhat less than this had the conditions remained the same as they were when the highest flow was obtained.

The leakage increases so rapidly with the increased height of the water in the reservoir that it is certain that when the pond is filled to the high water mark the quantity lost by leakage will be greatly in excess of the quantities given above. The distribution of the leakage is such that there is no danger for the present at least of the destruction of the dam, and it is likely that even when the reservoir is full the leaks will not be sufficient to cause alarm. The leakage, however, should be carefully watched for some time, especially at times when the reservoir is full, in order that any increase in the flow may be immediately determined. Some of the smaller leaks are likely to be reduced by the deposit of silt carried by the water, but it is not likely that the quantity of water lost from the reservoir will be diminished materially.

The leakage from Birch pond appears to be practically all from the Walnut street end of the dam. The water finding its way through the dam is collected in a drain which discharges at a point just below the dam, and the measuring weir is located at the point of discharge. When the measurements were begun the water in the reservoir was about 4 feet 4 inches below high water and the leakage was found to be 152,000 gallons per day. During the period covered by the observations the water has gone down 6 feet 3 inches, or to a point about 12 feet 7 inches below high water mark, and the leakage has been reduced to 9,600 gallons per day, indicating that practically all the leakage occurs when the pond is above this level.

The Birch pond dam has been in existence for many years and perhaps the best evidence that leakage does not necessarily affect the stability of such a dam is the fact that the Birch pond dam is in apparently as good condition to-day as it was when it was built.

Very few earth dams are absolutely tight, and for purposes of comparison I have prepared the accompanying table, giving such facts as I have been able to obtain in regard to the leakage from the reservoirs where the leakage has been measured. Statistics are also included showing the height and length of the different dams. It will be seen that the leakage from both of the Lynn ponds is very large in comparison with the leakage at the other places, even when the size of the dams is taken into account.

A serious feature is the great loss of water, which from Walden and Birch ponds alone is likely to amount to nearly 1,000,000 gallons per day when the ponds are full, or nearly one-fifth of the total quantity of water used for the supply of the city.

Respectfully submitted,

WILLIAM S. JOHNSON.

Sanitary and Hydraulic Engineer.

Town or City.	Reservoir.	Leakage in Gals. per 24 Hours.	Level of Water in Reservoir when Measurement was made. Feet below High Water.	Length of Dam. Feet.	Height of Dam. Feet.
Lynn	Walden Pond	*400,000	7.5	2,400	37
Lynn	Birch Pond	152,000	4.3	850	21
Winchester	North Reservoir	49,680	....	700	25
Winchester	South Reservoir	118,000	....	850	33
Athol	Phillipston Reservoir	36,000	Full	1,050	12
Athol	Buckman Brook Reservoir	18,000	Full	400	24
Athol	Summer Street Reservoir	5,000	0.4	....	..
Fitchburg	Overlook Reservoir, North Dam	22,000	....	1,000	22
Fitchburg	" " South Dam	46,000	5.0	400	42
Metropolitan	Ashland Reservoir	120,000	....	1,700	49
Metropolitan	Hopkinton Reservoir	60,000	....	1,500	55
Springfield	Ludlow Reservoir	60,000	....	2,350	39

* This measurement was made on the slope of the dam and does not include all of the water lost from the reservoir.

RULES AND REGULATIONS.

The State Board of Health, acting under the authority of Section 113 of Chapter 75 of the Revised Laws, and every other act thereto enabling, hereby makes the following rules and regulations for the purpose of preventing the pollution and securing the sanitary protection of the waters of Breed's pond, Birch pond, Walden pond and Hawkes pond and their tributaries, used by the city of Lynn as sources of water supply, which shall remain in force until further order, and which may be hereafter from time to time amended or added to by the State Board of Health.

1. No cesspool, privy or other place for the reception, deposit or storage of human excrement, and no urinal or water-closet not discharging into a sewer, shall be located, constructed or maintained within fifty feet of high-water mark of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or within fifty feet of high-water mark of any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds.

2. No human excrement shall be deposited or discharged in or into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or in or into any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds; and no human excrement shall be kept in, or deposited or discharged in or into any cesspool, privy or other receptacle situated within two hundred and fifty feet of high-water mark of either of said ponds, or within two hundred and fifty feet of high-water mark of any open waters, the water of which flows directly or ultimately into either of said ponds, unless such cesspool, privy or other receptacle is so constructed that no portion of its contents can escape or be washed into any such waters.

3. No human excrement, or compost containing human excrement, or contents of any privy or cesspool or sewer, or other receptacle for the reception or storage of human excrement, shall be deposited or discharged

upon or into the ground at any place from which any such excrement, compost or contents, or particles thereof, may flow or be washed or carried into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or into any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds.

4. No house slops, sink waste, water which has been used for washing or cooking, or other polluted water, shall be discharged into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or into any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds; and no house slops, sink waste, water which has been used for washing or cooking, or other polluted water, shall be discharged into the ground within fifty feet, or upon the ground within two hundred and fifty feet, of high-water mark of either of said ponds, or into the ground within fifty feet, or upon the ground within two hundred and fifty feet, of high-water mark of any open waters flowing as aforesaid into either of said ponds.

5. No garbage, manure or putrescible matter whatsoever shall be put into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or into any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds, and no garbage, manure or putrescible matter whatsoever shall, except in the cultivation and use of the soil in the ordinary methods of agriculture, be put upon the ground within two hundred and fifty feet of high-water mark of either of said ponds, or within two hundred and fifty feet of high-water mark of any open waters flowing as aforesaid into either of said ponds.

6. No stable, pigpen, henhouse, barnyard, hogyard, hitching or [illegible] place or other place where [illegible] be located, con- [illegible] within fifty feet of high-water mark of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of

water supply, or within fifty feet of high-water mark of any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds. No stable or other place, as above enumerated, shall be located, constructed or maintained within two hundred and fifty feet of high-water mark of either of said ponds, or within two hundred and fifty feet of high-water mark of any open waters flowing as aforesaid into either of said ponds, unless suitable and adequate provision is made to prevent any manure or other polluting matter from flowing or being washed into either of said ponds or such open waters

7. No interment shall, except by permission of the State Board of Health, be made in any cemetery or other place of burial, within fifty feet of high-water mark of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or within fifty feet of high-water mark of any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds

8. No lands, which were not under the control of cemetery authorities and used for cemetery purposes on May 2, 1907, from which the natural drainage flows into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or into any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds, shall be taken or used for cemetery purposes until a plan and description of the lands which it is proposed to use for such purposes, sufficient for their identification, shall be presented to the State Board of Health, and until such taking or use shall be approved in writing by said State Board of Health.

9. No manufacturing refuse or waste product or polluting liquid, or other substance of a nature poisonous or injurious either to human beings or animals, or other putrescible matter whatsoever, shall be discharged directly into, or at any place from which it may flow or be washed or carried into, Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or into any reservoir, lake, pond, stream, ditch, water course or other open waters the water of which flows directly or ultimately into either of said ponds.

10. No system of sewers or other works for the collection, conveyance, disposal or purification of domestic or manufacturing sewage or drainage, or any other putrescible matter whatsoever, shall, except in accordance with plans first approved in writing by the State Board of Health be constructed or maintained at any place within the water sheds of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No private or separate sewer shall be constructed or maintained, having an outlet upon or in the ground within two hundred and fifty feet of high-water mark of either of said ponds, or within two hundred and fifty feet of high-water mark of any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds.

11. No public or private hospital, or other place intended for the reception or treatment of persons afflicted with a contagious or infectious disease, shall, until the location and construction thereof have been approved in writing by the State Board of Health, be located or constructed at any place within the water-sheds of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No public or private hospital, or other place intended for the reception or treatment of persons afflicted with a contagious or infectious disease, shall be maintained at any place within such water-shed, unless all the provisions required by the State Board of Health for the purification or disposal of sewage, drainage or other polluting or organic matter, which may be discharged therefrom, have been complied with, and unless all orders issued from time to time by said State Board of Health in relation to the purification and disposal of sewage, drainage and other polluting or organic matter, which may be discharged therefrom are fully complied with.

12. No tannery, currying shop, or other establishment or place where the skin, wool, hair or fur of any animal is treated, shall, until the location and construction thereof have been approved in writing by the State Board of Health, be located or constructed at any place within the water-sheds of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No tannery, currying shop, or other establishment or place where the skin, wool, hair or fur of any animal is treated, shall be maintained at any place within such water-sheds, unless all the provisions required by the State Board of Health for the purification or disposal of

sewage, drainage or other polluting or organic matter, which may be discharged therefrom, have been complied with, and unless all orders issued from time to time by said State Board of Health in relation to the purification and disposal of sewage, drainage and other polluting or organic matter, which may be discharged therefrom, are fully complied with.

13. No slaughter house or other building for carrying on the business of slaughtering cattle, sheep or other animals, and no melting or rendering establishment, shall, until the location and construction thereof have been approved in writing by the State Board of Health, be located or constructed at any place within the water-sheds of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No slaughter house or other building for carrying on the business of slaughtering cattle, sheep or other animals, and no melting or rendering establishment, shall be maintained at any place within such water-sheds, unless all the provisions required by the State Board of Health for the purification or disposal of sewage, drainage or other polluting or organic matter, which may be discharged therefrom, have been complied with, and unless all orders issued from time to time by said State Board of Health in relation to the purification and disposal of sewage, drainage and other polluting or organic matter, which may be discharged therefrom, are fully complied with.

14. No person shall bathe in, and no person shall, unless permitted by a special regulation or by a written permit of the State Board of Health, fish in, or send, drive or put any animal into, Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No person other than a member, officer, agent or employee of the Public Water Board of Lynn, or public officer whose duties may so require, shall, unless so permitted by regulation or permit of said State Board of Health, enter or go, in any boat, skiff, raft or other contrivance, on or upon the water of either of said ponds, nor shall enter or go upon, or drive any animal upon, the ice of either of said ponds.

15. No person shall enter upon Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, for the purpose of cutting or taking ice, or cut or take ice from either of said ponds, without a written permit of the State Board of Health, stating the time and place for which such permission is given.

16. All reports which may be made to any board of health, or to any health officer of any city or town, of cases of contagious or infectious disease occurring within the water-sheds of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, shall be open to the inspection at all reasonable times of the Public Water Board of Lynn, its officers or agents.

COMMONWEALTH OF MASSACHUSETTS

STATE BOARD OF HEALTH

BOSTON, June 19, 1907.

To the Public Water Board, Lynn, Mass.:

GENTLEMEN, — I beg to inform you that at a meeting of the State Board of Health, held on June 6, 1907, it was voted, under the authority of Chapter 467 of the Acts of the year 1907, to amend the rules and regulations adopted on May 2, 1907, for the sanitary protection of the water supply of the city of Lynn, as follows:

RULE 7. No interment shall, except by permission in writing by the public water board of Lynn, be made in any cemetery or other place of burial, within fifty feet of high-water mark of Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, or within fifty feet of high-water mark of any reservoir, lake, pond, stream, ditch, water course or other open waters, the water of which flows directly or ultimately into either of said ponds.

RULE 14. No person shall bathe in, and no person shall, unless permitted by a special regulation or by a written permit of the public water board of Lynn, fish in, or send, drive, or put any animal into Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply. No person other than a member, officer, agent or employee of the public water board of Lynn, or public officer whose duties may so require, shall, unless so permitted by regulation or permit of said board, enter or go, in any boat, skiff, raft or other contrivance, on or upon the water of either of said ponds, nor shall enter or go upon, or drive any animal upon, the ice of either of said ponds.

RULE 15. No person shall enter upon Breed's pond in the city of Lynn, Birch pond in the city of Lynn and the town of Saugus, Walden pond in the city of Lynn and the towns of Saugus and Lynnfield, or Hawkes pond in the towns of Saugus and Lynnfield, said ponds being used by the city of Lynn as sources of water supply, for the purpose of cutting or taking ice, or cut or take ice from either of said ponds, without a written permit, signed by the public water board of Lynn, stating the time and place for which such permission is given.

By order of the Board,

CHARLES HARRINGTON,

Secretary.

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

CITY OF LYNN, MASSACHUSETTS

For the Year Ending December 19, 1908

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

Compliments of

★ *The Public Water Board*

LYNN, MASS.
FRANK S. WHITTEN, PRINTER.
1909. R.L.M.

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 19, 1908.

LYNN, MASS.
FRANK S. WHITTEN, PRINTER.
1909.

OFFICERS FOR 1908.

	Term expires.
Edward E. Pinkham	First Monday in April, 1909
Harry A. Swett	First Monday in April, 1910
Edward V. French	First Monday in April, 1911
John J. Heys	First Monday in April, 1912
Thomas Campbell, 2nd, *Pres.*	First Monday in April, 1913

D. A. Sutherland, *Clerk of Board and Superintendent.*
Wallace O. Mudge, *Water Registrar.*
Charles A. Cowles, *Pumping Engineer.*
George H. Venn, *Assistant Engineer.*
Reynold H. Sutherland, *Chief Draughtsman.*
James F. Pool, *Chief Inspector.*
Horace G. Littlefield, *Foreman of Mains.*
Henry T. Wheelock, *Foreman of New Services.*
Louis L. Cunningham, *Foreman of Service and Main Repairs.*
Warren H. McClain, *Foreman of Meters.*
John H. Newhall, *Foreman of Water Shed.*
Reuben J. Mansir, *Foreman of Stable.*
Joseph N. Driscoll, *Storekeeper.*

Clerks.

R. Guy Northey.
Mabel R. Butler.
Helene C. Pinkham.
L. Myrtle Hiller.

Inspectors.

William B. Moulton.
John Chamberlain.
James E. Driscoll.
Frederick E. Sprague.
Harry L. Niles.

ANNUAL REPORT.

To the Honorable, The Mayor and City Council:

GENTLEMEN, — The Public Water Board submit the thirty-seventh annual report of the department in accordance with the requirements of the City Charter and the ordinances.

The membership of the Board has been unchanged during the year. Mr. Thomas Campbell, 2nd, President, was re-elected in April for a term of five years.

Financial.

The receipts and expenditures for the year were as follows:

RECEIPTS.

Meter rates for the year	$118,318 00	
Fixture rates for the year	108,293 00	
Rates due in previous years paid in 1908	32,197 00	
Miscellaneous	16,070 00	
Total receipts		$274,878 00

EXPENDITURES.

Mains — Replacing old and weak cement pipes by cast-iron	$54,076 00
Extensions and ordinary repairs	15,236 00
Services—Relaid due to replacing the old cement pipe	23,067 00
Ordinary repairs and new services	10,000 00
Meters—New meters and repairs	9,600 00
Salaries and office expenses	13,731 00
Pumping Stations—Coal, supplies, repairs, etc.,	25,559 00
Stable and Shop—Expenses, carriages, wagons, etc.,	6,603 00
Amount carried forward.	$157,872 00

Amount brought forward,	$157,872 00	
Ponds, etc.—Patrolling water sheds, wood cutting, gypsy moths, care of brooks, canals, etc., and taxes	10,718 00	
Damages—Water rights, pipe leaks, etc.	3,922 00	
Saugus—Rebate of water rents	6,944 00	
Expenses due discussion of plans for improving the water supply, Engineering Reports, Experimental Filter, etc.	1,812 00	
		$181,268 00
Interest on bonds		67,953 00
Payment to sinking funds		25,657 00
		$274,878 00

The expenses for the year were large due to repairs and improvements in equipment which in many directions were necessary for the preservation of the property. An expenditure of over $75,000 was made for replacing old cement mains and the connecting services, thus removing a good deal of old pipe which was worn out and unsafe to longer depend upon. It had been constantly causing an expense for repairs, and now and then considerable claims for damages due to bursts. The work done is outlined fully under the various other headings.

A special effort was made during the year to collect all the water rents. There is some delay yet and some opposition to prompt payments. It is somewhat a matter of education to have all water users understand that the City Ordinances require payments at certain times and compel the shutting off of the water if the delay goes beyond a limited period. By constantly pressing this matter trouble will grow less until eventually collections will in the main be readily made.

The amounts due on January 1st, and still unpaid were as follows:

Fixture rates, account 1908	$4,596 00	
Meter rates, account 1908	3,634 00	
Construction, account 1908	538 00	
Amount still due from accounts previous to 1908,	16,936 00	
Miscellaneous	1,288 00	
		$26,992 00

Sinking Funds.

A careful examination of the condition of the sinking fund was made and in Table (A) attached is shown the amounts which have been paid into the present funds up to now, the average per year and the amount which it would have been necessary to put in to have made the annual payments the same each year during the life of the fund. It is shown that in all but one fund the past payments have been less than this amount, so that the future payments will have to be materially larger to cover the bonds at maturity.

If in the past the funds of the department had permitted, payments should have been made to the sinking fund so that with the interest on the bonds the amount paid yearly would have been about the same each year for the thirty years more or less during which the fund runs. This equitably distributes the payment over the generation which is getting the special benefit of the improvements for which the loan paid. In the past, old loans required so large a share of the money available that the present funds got a smaller yearly contribution than an equal annual payment would require.

Taking the funds as they stand, Table (B) shows the annual payments which *must at least* be made to take care of all bonds as they come due. This has been so figured that the total yearly payments for interests and sinking fund contributions will be equal amounts each year, the result is that an annual total payment of about $85,300 from now to 1932 will take care of all the bonds as they come due.

It would probably be more equitable to make larger payments to the sinking funds than the above during the next twelve years and smaller payments in the following years, this would reduce these sinking fund requirements by 1922 about when it is expected considerable further expenditures will have to be made to extend to the Ipswich River. The sinking fund commissioners think a lower rate of interest should be used to be surely on the safe side and this would slightly increase the necessary yearly payments above that shown in the table, though it would not be large.

The Board believe it would be a good plan to establish a table for sinking fund payments to cover the present funds in order that this matter might be definitely settled for the coming years. It is probable that a rate of payment greater than Table (B) would be desirable but a rate less than would be necessary if each fund as it stands to-day was added to at a rate sufficient to pay this fund individually on expiration. By working the funds somewhat together the load which would have to be carried, due to smaller payments than required in the past, would be distributed over a longer time, thus adjusting the matter on an equitable basis. The resources of the department would easily permit this.

Improvements and Increase of Water Supply.

The plan for improving and enlarging our supply submitted in accordance with legislative requirements to the State Board of Health on December 31st, 1907, was generally approved by the State Board on January 15th, 1908, the letter of approval following:

JANUARY 15, 1908.

To the Public Water Board of the City of Lynn:

GENTLEMEN,– The State Board of Health received from you on December 31, 1907, the following communication submitting the results of investigations for improving the water supply of the city and a general plan of the work proposed :-

"In accordance with chapter 479 of the Acts of 1907, of the Legislature, we submit herewith an abstract of the full report upon our water supply made by our Engineer Mr. William S. Johnson. We have decided to adopt Scheme B, that is, filtration. Mr. Johnson will furnish detailed results of the investigations and full plans of the work proposed."

The application was accompanied by a report of your engineer giving a brief summary of the conclusions reached as the result of investigations carried on during the year 1907 and a general plan showing the location of the proposed filters and other works, and subsequently the full report of your engineer was presented.

The plans presented provide for the filtration of the water before it is supplied to the city through six sand filters having an aggregate area of three acres, to be located upon the city farm; for the drainage of swamps on the watersheds of the ponds; and for pumping the water of Saugus River into Hawkes Pond in order to avoid flowing the extensive meadows above Montrose, which is necessary under existing conditions if water is to be diverted into Hawkes Pond by gravity through the present canal and conduit. It is proposed to omit for the present the construction of the conduit or pipe line designed for conveying the water from Saugus River to the upper end of Walden Pond.

The Board has considered the application and the report and plan submitted therewith and concludes that the proposed plans will, if carried out, provide a satisfactory water supply for the city of Lynn, and the Board approves the general scheme presented, known as Scheme B, which provides for filtering all of the water supplied to the city through sand filters to be located on the city farm.

The area of filters which it is proposed to provide will be sufficient for the requirements of the city in the beginning, but after a few years' use either the rate of filtration will have to be increased or the area enlarged in order to provide for the increasing requirements of the city. It seems to the Board undesirable to operate filters for the purification of this water at rates much higher than those which have been found to be successful in the filtration of polluted waters in this State, and the Board would advise that the filters be not operated at a rate materially greater than 2.500,000 gallons per acre per day.

The Board believes it important to provide for the storage of the water of Saugus River for as long a time as practicable before it is supplied to the city, and for this reason it is desirable that the water discharged from that stream into Walden Pond should be introduced at some point remote from the dam instead of discharging it at the dam as at present. The Board recognizes that there might be economy in making changes in the present works for conveying, storing and pumping water, and, under the circumstances, deems it reasonable to postpone the adoption of a definite plan for dealing with this question until a further study can be made. It is important, however, in the opinion of the Board, that this question of the storage of the water delivered from Saugus River be taken up without delay and a definite plan selected and carried out as soon as practicable.

The improvements proposed by draining the swamps on the watershed and avoiding the flooding of the swamp above the intake at Montrose will tend to reduce the color of the water, and are desirable measures to carry out in connection with the other proposed improvements in the water supply system of the city.

The Act under which the present plans are presented requires the submission of plans for the proposed conduits, reservoirs, pipe lines, filters and other works for improving the water supply of the city of Lynn to this Board for its approval; and the Board would suggest that when the final detailed plans of the proposed works have been prepared, they be submitted for the consideration of the Board before construction is begun.

By order of the Board,

(Signed) CHARLES HARRINGTON,
Secretary.

During the early months of the year the Board met the City Government several times in joint session and were searchingly questioned by the City Solicitor and some of the members, regarding the plans proposed, the reasons for them, the general course advised, etc. The Board showed thoroughly the work which had been done and the many reasons for the actions which had been taken on all points.

By Chapter 479 of the Acts of 1907, the Board were directed to begin work June 6th, 1908, on the plan approved. An appeal to the Legislature by the City Government resulted in delay for reconsidering the plan, the Act of the Legislature being as follows: Chapter 610, Acts of 1908.

SECTION 1. The time within which the construction of the works for the enlargement and improvement of the water supply of the city of Lynn, required by the provisions of chapter four hundred and seventy-nine of the acts of the year nineteen hundred and seven, shall be begun by said city is hereby extended to the first day of January in the year nineteen hundred and nine, and the time within which said works shall be completed is hereby extended to the first day of January in the year nineteen hundred and eleven.

SECTION 2. The time for submission of plans for said proposed improvements to the state board of health by the public water board of the city of Lynn, as provided in section six of said chapter four hundred and seventy-nine, is hereby extended to the fifteenth day of October in the year nineteen hundred and eight. Said plans before such submission to the state board of health shall be submitted to the city council of Lynn for examination at a date not later than the fifteenth day of August in the year nineteen hundred and eight. If after the submission of said plans to the state board of health as aforesaid, but not later than the twentieth day of October in the year nineteen hundred and eight, the city council of Lynn shall request a hearing on the matter of the acceptance of said plans the state board of health shall, before finally passing upon them, grant a hearing thereon to the said city council at such time and place as the board shall fix. The state board of health shall act on said plans not later than the fifteenth day of November in the year nineteen hundred and eight. Any plans heretofore submitted to the state board of health by the public water board of the city of Lynn and approved by the state board of health under the provisions of said chapter four hundred and seventy-nine, are hereby recommitted to the said public water board of the city of Lynn, and, except as said chapter four hundred and seventy-nine, is specifically modified hereby, the city of Lynn shall proceed in accordance with its provisions.

SECTION 3. This act shall take effect upon its passage. (Approved June 11, 1908.)

Complying with this Act the Board reconsidered the plans for improving and enlarging the water supply, and all the alternatives which had been suggested. On August 15th, as required, a report in printed form, was submitted to the City Council. After further consideration of over seven months, the Board more strongly felt that the general plan for the Lynn supply requiring filtering after long storage was still in every way the best plan and the only one which could wisely be recommended to the city. To meet the sentimental objection which had been raised to locating filters on the poor farm, a location on the cricket grounds on the lower end of Birch Pond was selected. Further study of the best method of getting the water from Hawkes to Walden Pond resulted in developing a plan, previously considered, of pumping directly across the turnpike at the point where the two ponds are near together. This made a simple arrangement with the great advantage of putting the Hawkes water into the far end of Walden Pond, thus entirely overcoming the objection of the State Board of Health to putting water in at the dam and taking it out again at the same point, a method which did not *insure* long storage.

On October 12th, a pamphlet was issued describing the conditions of our present supply and giving the reasons why improvements are needed to secure a satisfatory water.

On October 15th, the report of August 15th was submitted by the Board to the State Board of Health again following requirements of the Legislative Act. On November 12th, reply was received from the State Board of Health giving unqualified approval to the plans submitted, their letter in full follows:

NOVEMBER 12, 1908.

To The Public Water Board of the City of Lynn:

GENTLEMEN, — The State Board of Health received from you on October 15, 1908, an application submitting a report outlining a plan for enlarging and improving the water supply of the city of Lynn, in compliance with the provisions of Chapter 610 of the Acts of the Legislature of the year 1908, entitled "An Act to extend the time within which the city of Lynn shall enlarge and improve its water supply"

Plans for improving the quality of the water supplied to the city of Lynn have been under consideration for many years. In 1898 the Public Water Board recommended a system of filtration similar to that of Lawrence, and in 1901 an Act of the Legislature, giving authority to the city of Lynn to take the water from the Ipswich River and to make an additional water loan, contained a provision giving the city power to establish works for filtering its existing and any additional water supply and to apply to that purpose any portion of the loan authorized by that Act.

In 1905 and again in 1906 the objectionable character of the water supplied for public use in the city of Lynn was reported to the Legislature, and in 1906 an act was passed directing the State Board of Health and the water board of the city of Lynn to investigate and prepare a plan for increasing and improving the water supply of the city. The results of the investigations were reported to the Legislature in 1907 and recommended slow sand filtration for the purification of the water. An act was then passed (Chapter [illegible] of the Acts of the year 1907), directing the city to provide an adequate supply of good water for all the requirements of the city, the works to be begun within one year and completed within three years after the passage of the Act. The Act did not, however, require that the works should be built in accordance with the recommendations, but authorized the city to make still further investigations upon enlarging and improving its water supply. A further investigation was accordingly made and the results presented in two plans, which were submitted to the State Board of Health for approval on December [illegible], 1907, as required by the provisions of the act above mentioned, and the plan for filtering the water, having been found to be the least expensive and most efficient of those submitted, was recommended by the Public Water Board and approved by the State Board of Health on January 14, 1908.

In order to give the city opportunity for still further investigations and consideration of the question, the Legislature of 1908, by the provisions of Chapter [illegible], extended the time within which the city should enlarge and improve its water supply [illegible] a period of one year, and ordered the plan approved by the State Board of Health on January 14, 1908, to be [illegible].

Since the passage of that Act [illegible] investigations appear to have been made by the Water Board and City Council.

The [illegible] presented for the [illegible] this Board under the provisions of Chapter [illegible] of the Acts [illegible], as amended by Chapter [illegible] of the Acts [illegible] report to the Mayor and [illegible] 1908, as follows:

1. [illegible] ponds to prevent [illegible] and color.

2. [illegible] about six feet, and dis-

charging it into the present canal through which it will flow to Hawkes Pond. The purpose of this pump is to obtain water from Saugus River without the necessity of raising the level of the river and flooding large meadow areas, which must now be done to get the water high enough to flow into the canal. Flooding the meadows causes the water to take up large quantities of vegetable matter and color and further, is only permitted during winter months, whereas it may be desirable to take the water at other times

3. Place a pump at the lower end of Hawkes Pond, carrying the discharge pipe across the turnpike to the northern end of Walden Pond. This pump simply to take water from Hawkes to Walden Pond; the advantage of this arrangement being as fully outlined above

   Each of these pumping equipments would be housed in a small inexpensive fireproof building, and the pumps will probably be driven by electric motors, taking current either from our own generator at the Walnut street pumping station, or from the station of the Lynn Gas and Electric Company, depending on which method proves cheaper.

4. From Walden Pond the water would flow by gravity through the existing pipes and tunnel to Birch Pond, thence through Birch and directly into the filters.
5. The water from Breed's Pond would flow to the filters through the present 22 inch pipe which now runs from Birch Pond to the pumping station
6. Slow sand filter beds in six divisions, and with an aggregate area of three acres, would be located at the lower end of Birch Pond on the cricket grounds. The water, after passing through the filters, would be collected in a clear-water basin of about one and three-quarter million gallons capacity.
7. From the clear-water basin the water would flow by gravity to the Walnut street pumping station through the present pipes. A few years hence a new pipe would be needed for about half of the way as by that time the consumption will probably be such that the present 30-inch main would not be able to carry the water required. From the pumping station the water will be pumped as now to the reservoir and standpipe on Pine Hill, from which it is distributed by gravity to the city.

Attached to and forming a part of this report is a plan showing the proposed works, including a pumping station near the Saugus River at Montrose to raise the water of the river into the canal leading to Hawkes Pond, a forcemain through which it is proposed to deliver the water into the northerly arm of Walden Pond and filtration works below Birch Pond with pipe lines connecting with the present pumping station and distributing system. The plan also shows a proposed future pumping station at the Ipswich River near the mouth of Will's Brook and the line of a forcemain through the valley of Will's Brook to Beaver Dam Brook but your report mentions several other ways by which the water of the Ipswich River can be utilized in connection with the present works when a future supply becomes necessary, some one of which may be found better than the method indicated upon the plan, and you do not recommend the definite selection of a plan for taking the water from the Ipswich River at the present time.

You also present an estimate of the proposed works, amounting to $313,900.00 and you estimate the cost of operating the filters at $6,000.00 per year.

The plan in general is similar to "Scheme B," so called, the plan recommended by your board last year when plans for the enlargement and improvement of the water supply of the city of Lynn were presented to this board on December 31, 1907, under the provisions of Chapter 479 of the Acts of the year 1907.

The Act of 1908, Chapter 610, already referred to, provided that the State Board of Health shall give a hearing to the City Council of Lynn upon the plans presented by your board, if requested to do so on or before the 20th of October in the year 1908, and a request having been made by the City Council, through the City Solicitor, for such hearing within the time prescribed, the Board, after conference with the City Solicitor, gave a hearing to the City Council of Lynn at its office on Thursday, November 5, 1908, at 11 A. M. At this hearing the City Council of Lynn was represented by the Mayor, City Solicitor, City Engineer and members of the City Council.

It was stated at the hearing that the City Council was opposed to the adoption of the plan before the Board, but no definite alternative plan was presented. Certain advantages were urged for "Scheme A", so called, submitted by your Board with "Scheme B" for the consideration of this Board in December last, the selection of which was not recommended, and reference was made to the possibility of purifying the Lynn water satisfactorily by the treatment with ozone. Reference was also made to the possibility of enlarging the storage capacity of the system by raising the dam of Breed's Pond. It was finally urged that the financial condition of the water department is not as satisfactory as published reports would indicate, and that expenditures for enlarging and improving the water supply should be kept within the smallest practicable limit.

The Board has considered the plans presented and the suggestions and considerations urged by the City Council at the hearing on November 5.

The Board considered carefully the provisions of "Scheme A" and the results likely to be attained under it in the enlargement and improvement of the water supply of the city, and found that by the estimates presented it would not only cost considerably more than "Scheme B" but that the protection and improvement of the water supply that could be secured under it would be in no respect equal to the results that would be secured by the adoption of "Scheme B". Such further improvements as might be obtainable under "Scheme A" by the enlargement of Breed's Pond, as suggested at the hearing, would, in the opinion of the Board, be inconsiderable, while the cost of enlarging Breed's Pond with attendant changes in the system would evidently be large and add materially to the cost of "Scheme A".

That the numbers of bacteria in a polluted water can be materially reduced by treatment with ozone is a fact that has long been known, and attempts have been made experimentally, and also in practice, in several places to purify water supplied by that method. The results do not show that that method under favorable conditions can be depended upon to remove bacteria or color from water more efficiently than slow sand filtration, and some form of filtration is a necessary part of the ozone process if used for the purification of water containing much color and organic matter, such as that of Lynn. Moreover, the efficiency of the process is dependent upon the certainty of an adequate and never failing supply of electric power, and upon competent expert supervision. The cost of operation has thus far been found to be great, and an adequate guaranty of the performance of such a system is obviously impracticable. In the opinion of the Board, the efficiency of this process, as shown by the most recent experiments and experience, has not been such as to enable the Board to approve its use for the purification of the water supply of the city of Lynn.

The plan now presented for the approval of this Board is similar, as already stated, to "Scheme B" presented last year, the important changes being that the water of Saugus River, after passing through Hawkes Pond, will all be pumped into the northerly arm of Walden Pond, whence it will flow to Birch Pond, from which it will be drawn to the filters, thus insuring the passage of the most polluted water of the present sources through the available storage reservoirs before delivery to the filters.

It is also proposed to change the location of the filters from the proposed site at the City Farm to a location below Birch Pond, the reason for the change apparently being that the lands at the City Farm had been used many years ago for the interment of persons who had died of contagious disease. Except for the change in the location, the plan of the filters is similar to that proposed and approved by this Board last year, that is, it is proposed to construct six sand filters, of the type used at Lawrence, having an aggregate area of three acres. With a filtration plant of that size the rate of filtration with the present consumption of water in Lynn will be about 2,400,000 gallons per acre per day, allowing that one filter will be constantly out of use for cleaning, repairs, etc.

With the increasing consumption of water the rate of filtration will become greater.

The water which will be applied to the filters at Lynn, under the plan now presented, will ordinarily contain small numbers of bacteria, and experiments upon the filtration of similar waters give no reason to doubt that the Lynn water under the proposed plan can be purified at a rate as high as 4,000,000 gallons per acre per day and possibly higher. The above remarks apply to the removal of bacteria only As regards the removal of tastes and odors, the difference in efficiency between rates of 2,400,000 and 4,000,000 gallons per acre per day would not be material.

Under the circumstances, the area of filters which it is proposed to construct in the beginning is, in the opinion of the Board, a reasonable one and an enlargement of the area will not be necessary until the available capacity of the sources now used has been reached.

The Board, acting under the provisions of Chapter 479 of the Acts of the year 1907, and Chapter 610 of the Acts of the year 1908, approves the plan presented for the enlargement and improvement of the water supply of the City of Lynn, as outlined in your report, dated August 15, 1908, and shown on the plan annexed thereto, except the pumping station at the Ipswich River and foremain through the valley of Will's Brook to Beaver Dam Brook shown on that plan, the selection of a definite plan for taking water from the Ipswich River being left for future consideration, as suggested in your report.

By order of the Board,

(Signed) WILLIAM C. HARRISON,

Acting Secretary.

In March a trip was made by the City Government and the Water Board to the filters at Lawrence and to some parts of the Lynn water sheds and many points were explained and considerable information gathered.

In the Spring an arrangement was made by the Council that Mr. Edwin F. Dwelley, Civil Engineer, review the work which the Board has done and the plans which they advised. Mr. Dwelley made a long report which together with the original full report of Mr. William S. Johnson, Engineer for the Board was later printed. Further discussion in the Fall in joint convention with the City Government occurred.

The Board felt obliged to severely criticise Mr. Dwelley's report believing that the basis on which his report was mainly founded was false, that in many cases there was an improper use of quotations which gave an entirely erroneous impression and that in several instances an attack was made, in a manner wholly unjustified, on the Board and on its engineer. All of this was frankly brought out in the joint meetings and in it all the whole aim of the Board was to clearly and honestly bring out the facts and so explain the whole situation that the conditions might be truly understood and action along false lines avoided.

The whole problem of enlarging and improving our water supply is somewhat technical and can only be intelligently judged after a careful study is made of the whole situation, the operation of the present system and the conditions which surround us. Although many hours of discussion occured in the joint meetings with the City Government the Board was unfortunately for nearly all of the time put simply in the defensive and compelled to spend much time explaining why this and that had been done, thus leaving little opportunity for detailed explanation and discussion of the real problem.

There has, as a matter of fact, been very little opportunity to discuss the actual merits of the several plans for improvements which have been offered, either with the government as a whole or with committees having this especial work in charge. The Board has been impressed with the great difficulty of getting the real facts of the case before the Government and the people. The result has been much opposition to what would undoubtedly have been mainly agreed upon if the facts were fairly appreciated.

Though the Board have been disappointed that agreement and united action has been impossible, they have met almost uniform courtesy throughout the whole discussion, and have confidence that in the end the real merits of the problem will be seen, erroneous impressions, and old prejudices brushed away and the very best plan finally adopted. This whole matter has entailed an immense amount of work on the Board in addition to the ordinary matters which must be considered all the time.

At the end of the year an appropriation of $5,000.00 was made for the preparation of plans and estimates, work on which commenced on January 1st, 1909, as the Act required. In all the discussions which have taken place during the year, no feasible alternative plan has been suggested, so that at the end of another twelve months the Board feel more firmly convinced than ever that simple slow sand filtering, coupled with preliminary long storage is the best plan for Lynn.

Experimental Filter.

In connection with the discussion of improvements of the water supply a small filter was built in the City Hall yard, the outlines of which are shown on the sketch accompanying the Superintendent's report. (page 40). This was started on July 11th and stopped on October 5th running about 86 days.

The filter was operated at a rate of about two and one-half million gallons per acre per twenty-four hours and a man was kept in attendance to explain the operation to any interested citizens. It was visited by nearly 25,000 people and much interest shown in it. The filter removed the color almost entirely from the water giving a practically white water at the discharge. The water which the filter had received had been long in storage so that it was considered probably free from any dangerous disease germs. During the year, probably mainly on account of the very dry weather, no considerable organic growths occurred in the ponds so that there was nothing for the filter to do in the way of removing such organisms, consequently there was no opportunity to judge the ability of the filter in improving the taste and odor of the water, this was regretted. The filter, however gave much information as to the operation of this method of water improvement.

Organization.

The work of the Water Department has greatly increased with the growth of the city. It was found necessary for the best efficiency to reorganize the working force, clearly specifying the line of work which each foreman is called upon to oversee and then holding the men strictly responsible for results. After much study a complete system was worked out and put in force and has given excellent satisfaction, materially increasing the efficiency of the men and the economy of the work.

In connection with this and naturally a part of it, a system for orders and records was adopted and a storekeeper appointed, so that the cost of every job may be fully known and all supplies carefully accounted for. A better system of daily plans and records was established so that the men doing the work are furnished with definite instructions. This required some additional draughting work and perfecting of methods but all has gone on smoothly and the foremen are now furnished with plans and material promptly so that work goes on without delay and with good efficiency.

This has all been done with about the same force of men and was simply a question of applying the same general methods to the department as are found in commercial work of similar character and size.

Inspections and Meters.

A good deal of trouble was constantly occurring due to complaints that meter charges were excessive. These were almost invariably due to leaks in the house which the owners had not appreciated. Meters were formerly read quarterly and when a leak occurred the result was often a large bill before it was discovered. The plan consequently was adopted, which exists in many cities, of having every meter read monthly, if an excess flow is found, notice is at once sent the owner so that leaks can be stopped before an excessive bill has occurred. This required several new inspectors, and has worked well and given general satisfaction.

The Board still firmly believe in the advisability of extending meters as rapidly as possible and have given consideration to the best method of doing this. To-day meters put into dwellings are purchased by the owners, while those for the larger concerns are bought and owned by the city. A uniform method is desirable to take care of future extensions and should probably be applied also to the meters already in use. It is the intention to develop some fair method to take care of this whole question as soon as other work will permit.

National Board of Fire Underwriters.

This body have a committee on fire protection who employ a number of expert engineers and for several years have been making complete investigations of the fire conditions in many cities. The engineers visited Lynn in July and August and made a complete investigation which was covered in a report by the Committee dated October, 1908. Investigation of the water works formed an important part of this work and the Board co-operated with the engineers in all ways.

In general the engineers found much to commend in the condition of the department and especially in the plans for strengthening the system as regards fire protection which the Board had under way and which they fully explained to the engineers.

As a part of the work tests of the amount of water available at the different parts of the city were made. Very large quantities of water were drawn from hydrants and the pressures recorded while the water was flowing. Seventeen such tests were made. The results showed that while considerable water could be delivered in most sections a good deal of improvement was necessary to furnish the supply which is now considered necessary with cities of about the size and character of Lynn. The general plan for strengthening the gridiron system already determined upon would meet the needs in practically all cases and the engineers felt that improvements in this direction were being carried out with reasonable speed. In the business or high value sections of the city a larger amount of water is needed to fight a possible conflagration and this would require a large new main from the reservoir to the center of the city as has already been considered. Some attention was given to the possibility of higher pressures and the general ideas which the Board have had were discussed with the engineers and it was their recommendation that some plan along some of these lines be carried out.

It is the belief of the Board that the suggestions made were good and should be carried out. Most of them are in line with improvements which the Board had already considered and were working upon as rapidly as conditions and finances would permit.

Water Supplies for Year.

About 2,239,000,0000 gallons of water were used during the year, about 1,537,000,000 came from the water sheds of the four ponds and about 702,000,000 gallons from the Saugus River.

The river was let into Hawkes Pond on January 18th and shut off on February 19th. The Saugus River water which had been pumped into Walden Pond was in storage from February 19th to June 2nd, when the exhaustion of Breed's and Birch Ponds necessitated the beginning of use of Walden. This gave a storage period of 105 days.

The amount of water in storage in the four ponds on the first of each month of the year was as follows:

	Million gallons.
January 1st, 1908	1,527
February 1st, 1908	1,951
March 1st, 1908	2,245
April 1st, 1908	2,381
May 1st, 1908	2,457
June 1st, 1908	2,373
July 1st, 1908	2,098
August 1st, 1908	1,840
September 1st, 1908	1,658
October 1st, 1908	1,326
November 1st, 1908	1,237
December 1st, 1908	1,096
December 31st, 1908	1,052

Saugus River was let into Hawkes Pond from December 6th to 16th. This water is not to be used until it has been put into Walden Pond and stored for a long time.

The year was the dryest which has been recorded since records were kept in Lynn beginning in 1872. The rainfall for the year at Walnut Street Station was 27.17 inches. The average rain fall is about 43 inches. Fortunately Walden Pond was filled in the spring so that there was ample water though by the end of the year it was drawn very low.

No considerable organic growth occurred in any of the ponds during the year so that there was little or no disagreeable taste or odor to the water, this was probably in part due to the dryness which also resulted in a water of better color than for average years.

The Water Sheds.

Careful inspection of the ponds and of their water sheds was continued during the year and every effort was made to discover and remove possible sources of pollution. The experiences of the men doing this work shows that without constant care some pollution would be almost sure to occur.

Leakage of Dams.

The measurement of the leakage of the dams was continued during the year and a report in the spring covering the period of full ponds was made by Mr. Johnson and is appended (page 78). The measurements show considerable leakage, decreasing as the ponds are lowered and increasing again as they are filled. The leakage for the same water levels does not change materially from time to time indicating that there is nothing serious going on other than a considerable loss of water when the ponds are full. It is believed desirable to continue these records and they are given in the tables accompanying the Superintendent's report (pages 70-71). By watching this matter any change can be detected and should any increase develop a remedy could be applied. The conclusions, therefore remain as a year ago that the loss of water is the main feature but as the supply available is ample this will not mean any serious money loss for years to come.

Consumption.

The per capita use of water has remained about the same as last year, being about 71.72 gallons per person per day, a reasonable amount for a city like Lynn. In accordance with the policy previously stated the Board are extending the use of meters as conditions will permit, believing this in every way the best method of selling water.

Pumping Engines and Stations.

The several pumping engines have done their work well during the year and have required no unusual repairs. The small station at the head of Birch Pond was used about 21 days in the fall, pumping about 140,000,000 gallons from Hawkes to Birch Pond. This was done rather than draw Birch Pond very low and let the water flow by gravity, it being considered safer and likely to give better water to keep Birch Pond nearly full. It was easier to start this pump than the large engine at Walden Pond.

Considerable repairs were made to the roof and fences at the Walnut Street Pumping Station and the station was equipped throughout with automatic sprinklers, supplied from both the high and low service systems. This gives the station the very best protection against fire and makes the chance of any considerable loss from this cause very remote.

As previously suggested a new pumping engine will be necessary within a few years at Walnut street, owing to the increased demand for water and to the general wearing out of the present Loretz pump.

Street Pipes.

Cast-iron pipe was much lower in price at the beginning of the year than in recent years so that the Board purchased a large amount and replaced over seven miles of generally weak cement pipe during the year. A large number of new hydrants were also added in co-operation with Chief Harris of the Fire Department as the Board fully concur in the idea that efficient fire fighting requires hydrants so near together that the sole capacity of the fire department can be concentrated on any fire through short lines of hose. The table shows the work done in these lines in comparison with previous years.

Year.	Main Pipe Laid. Miles.	Ft.	Service Pipe Laid.	New Hydrants.	Hydrants Renewed.
1903	1	4,051	7,900 ft.	1	3
1904	4	1,116	9,957 ft.	—	2
1905	3	3,218	24,648 ft.	22	—
1906	2	4,897	24,419 ft.	15	—
1907	4	326	27,689 ft.	30	19
1908	7	1,362	36,459 ft.	72	17

There remained at the end of the year about seventeen miles of cement pipe, the cost of replacing which with pipe of proper size is estimated at about $117,000.00. About six miles of this is very old and entirely unsafe, the remainder is of later date and can probably do service for several years yet.

A serious burst occurred in a 6-inch cement pipe on River street on June 10th, throwing stones, gravel and water into an adjoining house and doing damage which cost the department $1,800.00 to settle.

Trouble occurs every now and then due to insufficient notice being given that streets are to be repaired, making it difficult to get new pipe put in without delaying the other work. Again in some cases streets are repaired without renewing old pipes which soon give trouble and necessitate the tearing up the new surface. It is the desire of the Board to co-operate fully with all other departments in this work in order that all pipe work may be done in a way to cause the least disturbance of the streets.

Repair Shop and Office.

The repair shop in the City Hall yard remains as formerly and as previously stated is totally inadequate for the work which the department must do.

We have now plans for a workshop which might be built on the city property on Broad street, and it is very urgent that a new and proper site be secured and a shop provided which will enable the Water Board to do the work required promptly and economically.

The office facilities in the City Hall are cramped and the department works under a disadvantage in this direction. It is desirable that additional room somewhat better arranged be made available as soon as possible.

The Water Department have felt the need of better telephone service and constantly find the work hindered and men losing time to answer telephone calls which are necessary for the ordinary conduct of the business. It is firmly believed that a central station in the City Hall connecting all departments would result in a great saving not only to the Water Department but to all other departments of the government, and it is strongly urged that this be considered and action taken if possible.

Coal.

Tests of coal have been made during the year. From the data obtained contracts made in the fall contain a guarantee for certain efficiency. It is believed that the intelligent use of this coal testing apparatus will result in much valuable information and a material saving to the city.

Swampscott.

The Water Board of Swampscott requested a price at which Lynn would sell water to the town. The whole matter was carefully considered and report made by City Engineer Leland in consultation with W. S. Johnson, Consulting Engineer and a price given to the Swampscott Board under which water could be sold under conditions which it was believed would be advantageous to the city and favorable to the town. The proposed price was considered by the City Government and question as to its equity raised by the Board of Aldermen. There was further some question as to the legal requirements and the matter was deferred for a time. Later, and after much discussion, and partly on account of the uncertainty as to Lynn's position, on the water situation, Swampscott voted to enter the Metropolitan district, thus settling the question permanently.

In General.

As the record of the work done will indicate the year has been an exceedingly busy one for the Board. The attempt has constantly been made to strengthen the department in every way and we believe that material progress has been made in many directions. The Board wish to acknowledge the courtesy which they have generally met whenever it became necessary to co-operate with other departments and it has been the desire of the Board to do everything possible to promote such harmonious relations.

Respectfully submitted,

THOMAS CAMPBELL, 2nd,
EDWARD E. PINKHAM,
HARRY A. SWETT,
E. V. FRENCH,
JOHN J. HEYS,

Public Water Board.

$ into even for	Total Paid for Interest on the Bonds of these Seven Funds for Year	Total paid for Interest and Contributions to these Seven Funds for Year	Amount put into old Fund. This fund covers all bonds issued prior to 1883	Interest Pai on all Loans
2,500	. . . . . .	2,500	27,333	60,3
2,500	. . . . . .	2,500	22,785	64,088
4,000	. . . . . .	4,000	28,180	64,807
5,000	471	5,471	31,082	65,081
6,500	300	6,800	42,844	67,308
2,500	485	12,985	56,344	72,608
1,000	689	12,889	50,640	80,184
4,500	1,517	10,017	42,306	81,251
14,100	2,037	26,137	51,443	60,804
0,000	2,970	22,970	45,039	70,785
6,000	3,744	9,744	42,816	74,009
3,000	4,714	27,714	50,541	68,334
6,000	4,603	10,603	48,821	73,346
6,000	4,731	10,731	37,868	73,846
6,000	5,129	11,129	54,551	74,846
6,000	6,001	12,001	38,006	74,996
6,000	6,197	12,197	66,309	74,996
6,000	6,437	12,437	46,097	73,796
3,028	6,059	30,087	50,000	72,506
0,000	6,623	20,623	21,127	70,249
6,000	10,484	36,484	5,000	85,702
6,665	14,415	61,080	. . . . . .	77,291
4,000	13,255	77,255	. . . . . .	68,740
2,000	17,015	59,015	. . . . . .	68,215
0,193 paid	122,084 20,000	502,277	. . . . . .	. . . . . .
. .	. . . . . .	. . . . . .	. . . . . .	. . . . . .
. .	. . . . . .	. . . . . .	. . . . . .	. . . . . .

[illegible]

[illegible]

Treasurer's Statement.

Amount of Debt, December 19, 1907	$1,778,500 00	
Bonds matured and paid 1908	10,000 00	
		$1,768,500 00

SINKING FUNDS.

Amount of funds December 19, 1907	$460,277 31	
Received from City Treasurer 1908	42,000 00	
Earnings of Sinking Funds 1908	20,759 47	
	$523,036 78	
Deduct bonds paid 1908	10,000 00	
	$513,036 78	
Amount in hands of City Treasurer	25,657 30	
		538,694 08
Total net debt		$1,229,805 92

Water Maintenance.

RECEIPTS.

From water rates etc.*		$274,462 68

EXPENDITURES.

For maintenance	$180,852 88	
For interest	67,952 50	
		248,805 38
Net income for year ending December 19, 1908,		$25,657 30

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*Difference in receipts and expenditures (See page 5 and 6) due to increase in wages authorized by Water Board and not allowed by his Honor the Mayor.

REPORT OF WATER REGISTRAR.

To Thomas Campbell, 2d, President:

I herewith present the financial condition of the department for the year ending December 19, 1908.

RECEIPTS.

Meter rates, account 1908		$118,318 34	
Meter rates, account 1907		27,878 63	
Meter rates, account 1906		292 59	
			$146,489 56
Fixture rates, account 1908		$108,292 91	
Fixture rates, account 1907		2,240 57	
Fixture rates, account 1906		1,785 70	
			112,319 18
Miscellaneous (sale of meters, junk, water for fire purposes, Saugus and sundry sales and repairs			10,782 52
Additional fixture rates not on regular assessment			1,848 98
Fines			251 00
Extra pipe, account 1908	Extra pipe account for services in excess of limit	1,791 29	
Extra pipe, account 1907		950 19	
Extra pipe, account 1906		6 75	
			2,748 23
Total receipts as per cash book			$274,439 47
Overdraft as per Auditor's statement			438 41
			$274,877 88

EXPENSES.

Maintenance	$174,324 13	
Interest	67,952 50	
Rebate to Saugus	6,943 95	
		249,220 58
Balance carried to sinking funds		$25,657 30

MAINTENANCE EXPENSES.

Mains	$69.312 02	
Services	33,067 18	
Walnut street, pumping expenses	17,624 14	
Salaries	13.731 42	
Meters	9.599 33	
Saugus rebate	6.943 95	
Care and patrol of water shed	6,720 42	
Stable and shop	6,603 17	
Walden pond, pumping expenses	3.990 69	
Miscellaneous expenses	3,181 20	
Clearing shores of ponds	2,002 70	
Damages by break in pipes	1,921 90	
Engine house, Walnut street	1,819 76	
Engine and boilers, Walnut street	1.568 83	
Brooks, cleaning beds	829 53	
Experimental filter	630 87	
Birch pond, pumping expenses	555 88	
Saugus tax	417 28	
Walden pond, care	382 78	
Saugus river gate	106 83	
Hawkes pond, care	79 78	
Lynnfield tax	61 81	
Breed's pond, care	54 28	
Reservoir, care	43 13	
Laboratory	19 20	
		$181,268 08

COMPARATIVE STATEMENT.

Receipts for 1908		$274,877 88
Receipts for 1907		290,111 18
Decrease		$15,233 30
Amount outstanding as per balance sheet		
Fixture rates, account 1908	$4,596 26	
Fixture rates, account 1907	544 91	
Fixture rates, account 1906	9.462 79	
Meter rates, account 1908	3.634 04	
Meter rates, account 1907	1,264 50	
Meter rates, account 1906	2.453 33	
Miscellaneous	1,287 70	
Construction, account 1908	537 62	
Construction, account 1907	347 73	
Construction, account 1906	2,862 12	
		$26,991 00

The accounts for 1906 includes the year 1906 and prior years. By order of the City Council all these bills were turned over to the City Treasurer for collection. The amount still uncollected at the end of the fiscal year was $14,278.00.

About $6,000.00 has been collected on 1907 and 1908 accounts between the close of the fiscal year and March 13, 1909.

CONSTRUCTION.

W. S. Johnson, Civil Engineer, special engineering, 1907-1908	$3,079 60	
Land, 17.46 acres	436 50	
Miscellaneous expenses, surveys	89 40	
		$3,605 50

Following will be found the usual tables.

(Signed) WALLACE O. MUDGE,
Water Registrar.

STATEMENT.

SHOWING COST OF WORKS TO DECEMBER 19, 1908.

Mains, hydrants and gates	$883,595	30
Walden and Glen Lewis ponds	564,658	42
New supply and land	339,882	02
Services and courts	337,885	20
Engines and boilers	140,327	29
Hawkes pond	161,036	53
Reservoirs and land	131,581	49
Birch pond and land	93,471	84
Engine house, pump and conduit, Walden pond	83,003	72
Pipe conduits and land	81,289	39
Engine house and land	57,562	39
Breed's pond and land	57,135	28
Hawkes pond canal	47,947	33
Force mains and land	41,546	13
Meters	37,531	42
Stand-pipe and pumping machinery	34,274	07
Highland service	12,431	17
Engineering	11,157	95
Tubular wells	9,470	02
Filteration (special)	6,488	90
Workshop and stable	2,056	97
Compressor	515	00
	$3,134,847	83
Less amount received for pipe	165,122	60
Total net cost	$2,969,725	23

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1908.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	13,118	1,233	14,351
Stores and shops	1.335	51	1,386
Factories	240	4	244
Offices	561	17	578
Restaurants and saloons	83	..	83
School-houses	60	11	71
Churches	33	5	38
Bakeries	30	..	30
Laundries	21	..	21
Engine-houses	12	3	15
Families	18,600	1,320	19,920
Boarding-houses	255	3	258
Faucets	35,320	2,180	37,500
Water-closets	16,715	638	17,353
Bath tubs	5,851	402	6,253
Hose bibs	3.340	207	3.547
Urinals	195	8	203
Heaters	436	88	524
Stationary engines	170	8	178
Motors	26	..	26
Green-houses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	23	1	24
Stand-pipes for water-carts	81	..	81
Sewer connections	25	..	25
Automatic sprinklers	127	5	132
Hydrants	927	180	1,107
Hydrants for car sprinklers	44	1	45

STATEMENT

SHOWING THE YEARLY REVENUE OF THIS DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871

From October 1, 1871, to January 1, 1872	[illegible]
From January 1, 1872, to January 1, 1873	[illegible]
From January 1, 1873, to January 1, 1874	47,992 01
From January 1, 1874, to January 1, 1875	[illegible]
From January 1, 1875, to January 1, 1876	[illegible]
From January 1, 1876, to January 1, 1877	[illegible]
From January 1, 1877, to January 1, 1878	[illegible]
From January 1, 1878, to January 1, 1879	[illegible]
From January 1, 1879, to January 1, 1880	[illegible]
From January 1, 1880, to January 1, 1881	[illegible]
From January 1, 1881, to January 1, 1882	[illegible] 70
From January 1, 1882, to January 1, 1883	[illegible]
From January 1, 1883, to January 1, 1884	[illegible]
From January 1, 1884, to January 1, 1885	[illegible]
From January 1, 1885, to January 1, 1886	[illegible]
From January 1, 1886, to January 1, 1887	[illegible] 70
From January 1, 1887, to January 1, 1888	[illegible] 73
From January 1, 1888, to January 1, 1889	[illegible] 77
From January 1, 1889, to January 1, 1890	[illegible]
From January 1, 1890, to January 1, 1891	[illegible] 47
From January 1, 1891, to January 1, 1892	171,744 [illegible]
From January 1, 1892, to January 1, 1893	[illegible] 88
From January 1, 1893, to January 1, 1894	[illegible]
From January 1, 1894, to January 1, 1895	[illegible]
From January 1, 1895, to January 1, 1896	[illegible] 88
From January 1, 1896, to January 1, 1897	[illegible]
From January 1, 1897, to January 1, 1898	[illegible]
From January 1, 1898, to January 1, 1899	[illegible]
From January 1, 1899, to January 1, 1900	[illegible]
From January 1, 1900, to January 1, 1901	[illegible]
From January 1, 1901, to January 1, 1902	[illegible]
From January 1, 1902, to January 1, 1903	[illegible]
From January 1, 1903, to January 1, 1904	[illegible]
From January 1, 1904, to January 1, 1905	[illegible]
From January 1, 1905, to January 1, 1906	[illegible]
From January 1, 1906, to January 1, 1907	[illegible]
From January 1, 1907, to December [illegible]	[illegible]
From December [illegible] to December [illegible]	[illegible]
	$[illegible]

FUNDED WATER LOAN.

When Payable.		Rate Per Cent.	Amount.
April	1, 1909	3½	$10,000
October	1, 1909	3½	100,000
April	1, 1910	3½	10,000
April	1, 1911	3½	10,000
November	1, 1913	4	20,000
November	1, 1914	3¾	31,000
March	15, 1915	4	50,000
December	1, 1914	4	20,000
December	1, 1915	3¾	6,000
April	1, 1916	3⅛	2,000
May	1, 1916	3½	24,500
September	1, 1916	4	10,000
October	1, 1916	4	9,000
February	1, 1917	3½	6,500
June	1, 1917	3½	3,500
July	1, 1917	4	7,500
August	1, 1917	4	5,000
October	1, 1917	4	2,000
November	1, 1917	4	6,500
April	1, 1918	4	15,000
June	1, 1918	4	10,000
[illegible]	[illegible]	4	50,000
April	[illegible]	4	100,000
July	[illegible]	4	110,000
January	[illegible]	4	35,000
April	[illegible]	4	150,000
[illegible]	[illegible]	4	50,000
October	[illegible]	4	25,000
January	[illegible]	4	50,000
[illegible]	[illegible]	4	25,000
April	[illegible]	4	40,000
[illegible]	[illegible]	4	105,000
[illegible]	[illegible]	4	50,000
September	[illegible]	4	25,000
[illegible]	[illegible]	4	25,000
[illegible]	[illegible]	4	10,000
[illegible]	[illegible]	4	25,000
January	[illegible]	4	25,000
[illegible]	[illegible]	4	25,000
[illegible]	[illegible]	3½	25,000
[illegible]	[illegible]	3½	75,000
[illegible]	[illegible]	3½	[illegible]
			$[illegible]

REPORT OF SUPERINTENDENT.

To the Public Water Board:

GENTLEMEN.—I herewith present the 37th Annual Report of the Superintendent for the year ending December 31st, 1908.

A detailed statement of the transactions of the Water Department will be given in tables, plans, diagrams, etc., to follow.

We have taken our supply of water during the past year from Breed's, Birch, Hawkes and Walden Ponds and Saugus River.

	Gallons
Total pumped in 1908	[illegible]
Total pumped in 1907	*[illegible]
Decrease in pumpage in 1908	[illegible]
Total consumption in 1908	[illegible]
Total consumption in 1907	*[illegible]
Increase in consumption	[illegible]

The average consumption of water per day in 1908 was 6,118,364 gallons showing an average increase of 103,058 gallons per day more than 1907.

The rainfall at the pumping station on Walnut street in 1908 was the minimum since 1872 when the rainfall was first recorded there by the Water Department, the total for the year being only 27.17 inches. The rainfall record at City Hall 30.51 inches. The consumption per capita in 1907 was 70.52. The consumption per capita in 1908 was 71.72, a slight increase over the previous year.

Notwithstanding the fact that we have had two very dry years, we have had a sufficient supply of water for all demands. On December 31st, 1907, our supply in all ponds was 1,519,000,000 gallons. December 31st, 1908, our supply was 1,050,000,000 gallons, 469,000,000 gallons less than than in 1907.

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*The difference between the water pumped and the consumption in 1907 was due to water put into Breed's Pond from the reservoir.

The new system which the different divisions of the department have been working under since May of this year has greatly increased the efficiency of the department.

The Draughting Division.

The Draughting Division has made plans for the laying of all the pipe that has been laid this year and has made plans showing the location of all main and service pipes with the location of all valves, branches, hydrants and shut-offs. It has issued 2,100 orders for stock to the storekeeper and made several tables and maps for the department.

Main Pipe Division.

The Main Pipe Division has laid about seven and one-half miles of cast-iron pipe this year. Nearly seven miles of this work was removing cement-lined pipe and relaying with cast-iron pipe. This is more than was ever accomplished on any previous year and with less expense per mile to the city which is due to the system which the department is working under as it facilitates matters so the work can be done with great dispatch.

The New Service Division.

The New Service Division has put in 300 new services this year in shorter time and with less expense than under the old method.

The Repair Division.

The Repair Division has charge of all repairs to services and main pipes. This work has been done effectively and economically.

The Meter Division.

The Meter Division has installed 604 new meters and has kept all meters in use repaired and in good condition, this has necessitated taking out many old and worthless meters and installing new ones in their places.

Stable.

The foreman who is on duty day and night has kept the stable in as good condition as possible owing to the limited quarters in the old building we now occupy.

It is greatly to the disadvantage of the Water Department that we do not have ample room for horses, carriages, and storage for special castings and room for storekeeper to contain all small goods, such as brass goods, gate valves, parts for repairs, etc., and we hope some action may be taken by the city in the near future, whereby new quarters may be provided.

Storekeeper.

Under the new system a storekeeper was appointed and all material and supplies have to be obtained from him and his duties are to keep a record of all goods delivered to the workmen and material used in all branches of the department. This branch of the system is an important one and a great saving to the city can be made.

Water Shed Division.

In the Water Shed Division there are four inspectors whose duties are to patrol the water shed of our water supply which extends over a large territory including Wakefield, Reading, Lynnfield and Saugus. There are several piggeries on our water shed which are closely watched although they are some distance from the brooks. Also the premises of all houses upon the water shed are inspected and vaults and cesspools are built whenever necessary to eliminate any pollution from entering our water supply.

Land Purchased.

Several acres of land on the water shed of Hawkes Brook in the town of Lynnfield that was occupied by a piggery has been purchased by the Water Department to prevent further pollution from that source.

Bridges and Repairs.

A new bridge has been built over canal below Howlett's pond dam and a bridge repaired at Breed's pond. A new sluice gate has been put in at Hawkes canal near Spring street in North Saugus and a new fence built around Walnut street pumping station.

Cleaning Brooks and Draining Swamps.

In 1906 the Water Department commenced the cleaning of brooks and partially draining of swamps and finished the work in 1907, since then the Inspectors have kept the brooks free from leaves and twigs, thereby giving us a large portion of what falls on the water sheds.

Main Pipe Leaks.

There were 91 main pipe leaks in 1907 and only 18 main pipe leaks in 1908 showing 73 less than in 1907 and we hope to continue the reduction in leaks until the minimum shall be reached. The main pipe leak that occurred in River street June 10th, 1908, caused damages to the amount of $1,800.00. There was such force to the water that it carried rocks, gravel and sand to the top of the Kelliher Block at Summer and River streets breaking glass in the windows, flooding the floors and otherwise damaging the building.

Cement Lined Pipe.

There are seventeen miles of cement-lined pipe remaining to be relaid with cast-iron pipe. The Board has planned to relay six miles of pipe in 1909 which will leave eleven miles to be relaid later. As the price of cast-iron pipe is much cheaper than for several years it would be an advantage to the city to have the entire seventeen miles relaid the present year so that the full pressure of water may be turned into the pipes without fear of breaks in our mains and would also give better service for fire protection.

The work of inspection of water fixtures will be found in table on page 70.

Experimental Filter.

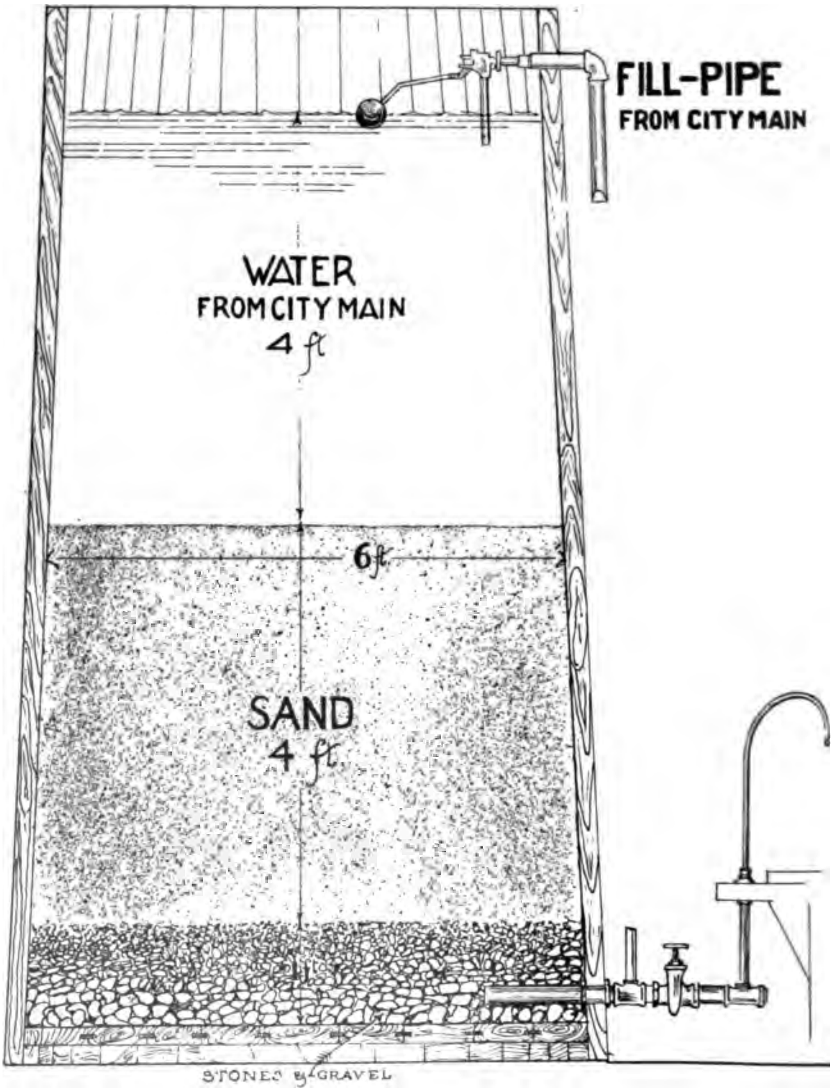
May 29th, 1908, the Public Water Board received an order from the City Government requesting that a small filter bed be installed near the City Hall, cost to be charged to maintenance.

The request of the City Government was complied with and a filter bed installed on the stable lot, adjoining the City Hall grounds and put into operation July 11th, 1908. It was successfully operated for eighty-six days and filtered at the rate of about 2,500,000 gallons per acre per day. On July 13th the water was tested to see what effect filtration would have in reducing the color. The unfiltered water showed color .40, filtered .21. On July 16th, another test was made, unfiltered color .40, filtered .15. On July 22d the third test was made as follows; unfiltered water color .37, filtered water color .06 and remained at .06 or below until we discontinued its use. A cut of the filter follows.

The water in the several ponds have been exceptionally free from growths of organism the past year owing to the very dry year. We have had no heavy rainfall to flush the meadows into the ponds which furnishes the food for algae growths. There were therefore no considerable taste and odors for the filters to remove.

D. A. SUTHERLAND,

Superintendent.


FILL-PIPE
FROM CITY MAIN
WATER
FROM CITY MAIN
4 ft
6 ft
SAND
4 ft
STONES & GRAVEL

SERVICES AND REPAIRS.

New services in Lynn	304
New services in Saugus	27
Services extended Lynn and Saugus	21
Services discontinued	26
Services renewed	589
Services changed from old main to new	692
Services repaired	336
Services leaks repaired	363
Services frozen	137
Services cleaned out, no force	2,241
Services changed	8
Service boxes, new	304
Service boxes renewed	28
Service boxes repaired and reset	142
Number of feet of lead-lined pipe used	49,871
Number of feet of galvanized pipe used	991
Lead connections renewed with corporations	1,014
Lead connections renewed without corporations	27
New meters	394
Meters repaired	722
Meters changed	210
Meters frozen	44
Meter boxes new	3
Meter boxes repaired	7
Finding and raising main gate boxes	8
Main gate boxes repaired and renewed	5
Fire hydrants new	72
Fire hydrants renewed	17
Fire hydrants repaired	55
Fire hydrants moved	9
Main gates new	134
Main gates renewed	4
Main gates repaired	10
Main pipe leaks	30
Car sprinklers repaired	8
New fire pipes	2
Private hydrants new	2
Private hydrants repaired	8

The following microscopic examinations were made by the State Board of Health.

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1908.	January 6.	February 18.	March 18.	April 25.	May 21.	June 29.	July 24.	August 24.	September 22.	October 26.	November 28.	December 21.
Number of Sample	43492	43737	43921	44128	44313	44530	44695	44870	45072	45272	45542	45647
Plants.												
DIATOMACEÆ:												
Asterionella	72	69	29	70	30	2	2	0	0	175	117	153
Cyclotella	13	2	1	17	6	10	10	1	1	8	21	37
Melosira	0	0	0	0	0	0	0	0	0	0	10	0
Synedra	18	24	8	129	5	1	1	2	3	1	2	30
Tabellaria	24	19	7	54	55	13	0	2	3	1	0	11
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	0	0	9	0	1	1	0
ALGÆ:												
Protococcus	50	228	28	8	0	[illegible]	0	0	0	0	0	0
Raphidium	0	0	2	1	24	5	0	0	8	8	0	0
Scenedesmus	4	0	0	[illegible]	8	0	0	0	0	0	0	0
Animals.												
INFUSORIA:												
Dinobryon	664	72	30	2	0	1	143	0	0	84	22	35
Uroglena	0	1	0	0	[illegible]	0	0	0	0	0	0	12
Glenodinium	2	0	1	[illegible]	0	1	0	1	0	0	0	0
Raphidomonas	0	0		[illegible]	0	0	17	0	0	0	0	0
VERMES: (Anuræa)	0	0	1	[illegible]	0	0	6	0	0	0	0	0
Polyarthra	0	[illegible]	0	[illegible]	1	0	0	0	0	0	0	0
CRUSTACEA: Cyclops	0	0	0		[illegible]	[illegible]	.02	0	.05	.12	.02	0
FUNGI:												
Zoöglœa	3	2	3	5	1	3	5	5	5	5	5	3
Total	851	304	115	288	130	40	178	20	20	283	178	281

Microscopical Examintion of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1908.	January 6.	February 18.	March 18.	April 25.	May 21.	June 29.	July 24.	August 24.	September 22.	October 20.	November 28.	December 21.
Number of Sample	43490	43736	43922	44127	44312	44538	44694	44878	45071	45273	45541	45640
Plants.												
DIATOMACEÆ:												
Asterionella	127	122	7	10	22	18	22	1	12	107	535	316
Cyclotella	20	34	60	134	92	251	108	3	3	1	34	21
Melosira	0	0	0	0	32	0	0	0	0	6	0	0
Synedra	32	9	36	127	44	1	0	17	2	4	27	59
Tabellaria	17	22	35	302	710	32	5	5	1	5	4	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	74	0	0	1	12	0	0	0
ALGÆ:												
Protococus	0	176	135	0	0	6	57	5	0	20	0	0
Raphidium	5	0	0	0	4	13	10	0	0	2	4	4
Animals.												
INFUSORIA:												
Dinobryon	820	0	0	0	[illegible]	[illegible]	0	0	63	2	0	10
Glenodinium	0	0	2	3	0	0	0	0	0	0	0	0
Chlansydomonas	1	2	0	0	0	0	0	0	0	0	0	0
Trachelomonas	0	0	1	1	2	0	2	11	1	0	0	0
Raphidomonas	0	0	0	0	4	0	1	2	0	0	0	0
VERMES: (Palyarthra)	0	0	0	0	0	0	1	0	0	0	0	0
Asplanchura	0	0	0	0	2	0	0	0	0	0	0	0
CRUSTACEA: (Cyclops	.02	0	.02	0	.04	0	.02	0	[illegible]	[illegible]	[illegible]	[illegible]
Daplmia	0	0	0	.02	0	0	0	0	0	0	0	0
FUNGI: Zoöglœa	2	1	2	5	5	3	6	2	5	5	0	[illegible]
MISCELLANEOUS:												
Zoospores	0	0	0	32	0	0	0	0	0	0	0	0
Total	1024	366	277	582	1021	[illegible]	212	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1908.	January 6.	February 18.	March 18.	April 25.	May 21.	June 29.	July 24.	August 24.	September 22.	October 26.	November 28.	December 21.
Number of Sample	43494	43738	43923	44129	44314	44540	44696	44880	45073	45271	45543	45648
Plants.												
DIATOMACEÆ:												
Asterionella	10	0	0	67	894	2	0	0	2	0	0	5
Cyclotella	5	0	1	0	39	21	0	1	9	15	85	121
Synedra	0	1	8	93	2	384	378	2	1	8	7	25
Tabellaria	0	0	5	20	9	11	0	0	1	1	0	4
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	14	0	0	0	0	0	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	8	0	0	5	0	0
Raphidium	0	0	1	0	10	11	5	0	2	0	12	4
Animals.												
INFUSORIA:												
Dinobryon	0	50	118	160	0	0	0	0	4	34	0	20
Mallomonas	0	0	1	0	0	0	0	0	0	0	78	1
Chlamydomonas	0	5	1	0	1	0	0	0	0	0	0	0
Glenodinium	0	2	[illegible]	13	0	23	8	0	0	0	2	0
Peridinium	0	0	0	0	0	0	14	0	0	0	0	0
VERMES: (Anuræa)	0	0	0	0	0	0	0	0	0	0	1	0
CRUSTACEA: (Cyclops)	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	0	.02	0	.02	0	.00
FUNGI:												
Crenothrix		[illegible]		[illegible]		15	5	2	0	0	2	0
Zooglœa	2	[illegible]	3	5	[illegible]	2	5	5	2	2	5	3
Total		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	21	65	192	183

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1908.	January 6.	February 18.	March 18.	April 25.	May 21.	June 29.	July 24.	August 24.	September 22.	October 23.	November 28.	December 21.
Number of Sample . .	43486	43739	43924	44130	44316	44541	44698	44882	45075	45269	45544	45649
Plants.												
DIATOMACEÆ:												
Asterionella	100	117	137	82	44	137	0	284	97	7	38	464
Cyclotella	16	17	13	90	322	109	72	8	1	5	36	47
Synedra	29	3	0	5	84	1	1	21	1	3	34	39
Tabellaria	50	24	2	92	642	312	1	30	6	4	0	16
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	2	2	11	9	2	0	0
ALGÆ:												
Protococcus	14	43	108	0	0	0	20	38	0	6	0	0
Raphidium	5	0	0	0	0	20	0	1	0	10	0	6
Animals.												
INFUSORIA:												
Cryptomonas	2	0	0	0	0	0	0	0	0	20	0	3
Monas	0	0	0	0	0	0	0	0	0	10	0	0
Dinobryon	1668	55	0	0	0	6	20	149	0	0	21	40
Trachelomonas . . .	0	0	0	1	1	0	7	7	1	7	3	1
Glenodinium	1	3	1	0	2	0	0	0	0	19	0	3
Raphidomonas . . .	0	0	0	0	2	0	0	0	1	0	0	0
VERMES: (Polyarthra)	0	0	0	0	0	0	0	1	0	0	0	0
CRUSTACEA: (Cyclops)	0	0	0	0	0	.04	0	.04	.08	0	.02	0
Daphnia	0	0	0	0	.02	0	0	0	0	0	0	0
FUNGI:												
Zoöglœa	5	2	2	5	3	3	5	5	5	8	8	6
Total	1890	264	263	275	1100	590	128	555	121	101	140	6 9

Microscopical Examination of Water from Saugus River, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1908.	January 6.	February 18.	March 18.	April 25.	May 21.	June 29.	July 24.	August 24.	September 22.	October 26.	November 28.	December 21.
Number of Sample	43196	43741	43926	44132	44317	44543	44697	44881	45074	45274	45546	45651
Plants.												
DIATOMACEÆ:												
Asterionella	0	0	0	72	0	0	0	0	0	0	0	0
Cyclotella	0	0	0	44	2	0	0	0	0	0	0	0
Navicula	11	0	0	0	2	4	8	2	0	0	0	1
Synedna	13	10	498	482	84	48	16	8	0	8	4	18
Tabellaria	3	0	0	8	2	0	1	0	0	0	0	0
Gomphonema	5	0	0	0	0	0	1	0	0	0	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	3	0	0	0	0	0	0
ALGÆ:												
Raphidium	0	3	0	0	0	0	0	0	0	0	0	0
Scenedesmus	0	0	0	0	10	0	0	0	0	0	0	0
Protococcus	0	0	0	0	0	12	0	0	0	0	0	0
Animals.												
INFUSORIA:												
Dinobryon	0	578	522	0	818	0	0	0	0	0	0	0
Mallomonas	0	5	2	2	0	0	0	0	0	0	0	0
Peridinium	0	0	0	0	0	0	0	0	0	0	0	0
Synura	0	2	22	2	2	0	0	0	0	0	0	0
Glenodinium	0	0	4	0	0	0	0	0	0	0	1	14
VERMES: (Anurea)	0	0	0	0	2	3	0	0	0	0	0	0
FUNGI:												
Crenathrix	1	20	0	0	0	1	0	0	0	1	0	0
Zoöglœa	5	[illegible]	3	5	5	5	5	5	5	2	1	3
Total	41	6[illegible]5	1051	[illegible]21	[illegible]33	7[illegible]	31	15	5	11	6	36

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1908.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase over 1907.	Average daily decrease below 1907.	Average to each inhabitant per day.	Average to each service per day.
January	186,254,131	6,008,198	149,477	. . .	70.43	424.00
February	192,427,870	6,635,444	88,051	. . .	77.78	468.27
March	170,990,782	5,515,831	. . . .	523,160	64.66	389.26
April	169,700,524	5,656,684	. . .	131,012	66.30	399.20
May	177,981,626	5,741,342	. . . .	212,513	67.31	405.17
June	200,636,731	6,687,891	420,417	. . .	78.40	471.97
July	221,034,242	7,130,139	523,484	. . .	83.59	503.18
August	200,394,303	6,464,332	. . . .	39,598	75.78	456.20
September	193,253,535	6,441,784	483,029	. . .	75.52	454.61
October	182,575,958	5,889,547	37,744	. . .	69.05	415.63
November	164,125,158	5,470,838	264,913	. . .	64.14	386.09
December	179,956,293	5,805,041	178,220	. . .	68.05	409.67
Totals and averages	2,239,331,153	6,118,364	. . . .	. . .	71.75	431.94

Basis—Population Lynn and Saugus, estimated from census of 1905, 85,300.

TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1908.

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	*.92	*.35	*.08	. .	. .	. .	. .	. .	.79	. .	. .
2	. .	. .	.40	. .	.05	. .	. .	. .	. .	. .	. .	. .
3	. .	. .	. .	. .	. .	. .	.17	.05	. .	. .	. .	. .
4	. .	. .	. .	. .	.06	. .	.04	.25	. .	. .	. .	.09
5	. .	*.04	. .	.12	. .	. .	. .	.15	. .	. .	. .	. .
6	. .	*.09	*.45	. .	. .	. .	. .	.43	.05	. .	. .	.16
7	.94	. .	. .	. .	1.74	. .	. .	1.25	. .	. .	. .	.65
8	. .	. .	. .	.42	. .	. .	. .	. .	. .	. .	.08	. .
9	. .	. .	. .	. .	.10	. .	. .	. .	. .	. .	. .	. .
10	. .	. .	. .	.03	. .	. .	. .	. .	. .	.12	.01	. .
11	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.15	.42
12	.53	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.11
13	. .	*.20	.17	*.01	.04	. .	. .	.09	. .	. .	. .	. .
14	. .	. .	. .	. .	.21	. .	.18	. .	. .	. .	.41	. .
15	. .	*.55	.21	.28	. .	.18	. .	. .	. .	. .	. .	. .
16	. .	. .	. .	. .	. .	.10	. .	. .	. .	. .	. .	. .
17	. .	. .	*.09	. .	. .	. .	.04	.18	. .	. .	. .	. .
18	. .	. .	*.60	.40	. .	. .	.75	. .	. .	. .	. .	.36
19	. .	1.20	. .	. .	. .	. .	. .	. .	. .	. .	.23	. .
20	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
21	. .	. .	. .	. .	.59	. .	.78	. .	. .	. .	. .	. .
22	. .	. .	. .	. .	.12	. .	. .	.18	. .	. .	. .	. .
23	*.18	* 03	.19	. .	. .	.30	. .	. .	. .	. .	. .	. .
24	* 02	. .	. .	. .	. .	.13	.18	. .	. .	. .	. .	. .
25	. .	. .	. .	.02	. .	. .	1.75	.27	. .	.04	.01	. .
26	.36	.74	. .	. .	. .	. .	. .	.91	. .	1.76	. .	. .
27	. .	. .	. .	.11	. .	. .	. .	. .	. .	. .	. .	. .
28	. .	. .	. .	. .	. .	. .	. .	. .	57	.22	. .	. .
29	. .	. .	.63	. .	. .	. .	. .	. .	. .	1.15	. .	. .
30	. .	. .	. .	.76	.31	. .	. .	. .	. .	.06	. .	. .
31	. .	. .	. .	. .	.01	. .	. .	. .	. .	. .	. .	.36
Total	2.03	3.77	3.09	2.23	3.23	.71	3.89	3.76	62	4.14	89	2.15

*Snow.

Total for the year, 30.51 inches.

The above rain-fall was measured with a standard rain-gauge. This gauge was formerly located on the roof of the City Hall and the results obtained were unsatisfactory due to roof structures, etc., and it was removed in 1906 to the roof of the stable on lot adjoining the City Hall grounds.

Gallons

TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1908.

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 . .	. .	.23	*.28	*.09	. .	.05	. .	. .	. .	.72	. .	. .
2 . .	. .	. .	.38	. .	.04	. .	. .	. .	. .	. .	. .	. .
3 . .	. .	. .	. .	. .	. .	. .	. .	.07	. .	. .	. .	. .
4 . .	. .	. .	. .	. .	.10	.01	.02	.27	. .	. .	. .	.06
5 . .	. .	*.16	. .	.11	. .	. .	. .	.16	.04	. .	. .	. .
6 . .	. .	.05	.32	. .	. .	. .	. .	.35	. .	. .	. .	.07
7 . .	.61	. .	. .	. .	1.48	. .	. .	1.24	. .	. .	. .	.48
8 . .	*.02	. .	.05	.30	. .	. .	. .	. .	. .	. .	.07	. .
9 . .	. .	. .	. .	. .	.08	. .	. .	. .	. .	. .	. .	. .
10 . .	. .	. .	. .	.03	. .	. .	. .	. .	. .	.15	. .	. .
11 . .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.12	*.49
12 . .	.44	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	*.22
13 . .	. .	.17	.15	.06	.06	. .	. .	.08	. .	. .	. .	. .
14 . .	. .	.14	. .	. .	.20	. .	.22	. .	. .	. .	.42	.02
15 . .	. .	.30	.21	.19	. .	.33	. .	. .	. .	. .	. .	. .
16 . .	. .	. .	. .	. .	. .	.15	. .	.06	. .	. .	. .	. .
17 . .	. .	. .	*11	. .	. .	. .	03	.14	. .	. .	. .	. .
18 . .	. .	. .	.48	.30	. .	. .	.73	. .	. .	. .	.10	*.36
19 . .	. .	*.85	. .	. .	. .	. .	. .	. .	. .	. .	.12	. .
20 . .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
21 . .	. .	. .	. .	. .	.40	. .	.63	.22	. .	. .	. .	. .
22 . .	. .	. .	. .	. .	.23	. .	.03	. .	. .	. .	. .	. .
23 . .	*.41	*.07	.15	. .	. .	.28	.17	. .	. .	. .	. .	. .
24 . .	*.18	. .	. .	. .	. .	.12	. .	. .	. .	. .	. .	. .
25 . .	.27	. .	. .	.03	. .	. .	1.54	.25	. .	. .	.05	. .
26 . .	. .	.60	. .	. .	. .	. .	. .	.33	. .	1.66	.02	. .
27 . .	. .	. .	. .	.05	. .	. .	. .	. .	. .	. .	. .	. .
28 . .	. .	. .	. .	. .	. .	. .	. .	. .	.46	.10	. .	. .
29 . .	*.16	. .	.52	. .	. .	. .	. .	. .	. .	1.18	. .	. .
30 . .	. .	. .	. .	.40	.30	. .	. .	. .	. .	.16	. .	.32
31 . .	*.02	. .	. .	. .	.03	. .	. .	. .	. .	. .	. .	. .
Total	12.11	2.57	2.63	1.55	2.92	.94	3.37	3.67	.50	3.97	.90	2 02

* Snow.

Total for the year 27.17 inches.

The above rain-fall was measured by a standard gauge. This gauge is located in the rear of Pumping Station on vacant lot.

TABLE IV.

SHOWING THE AVERAGE DEPTH OF THE WATER IN PONDS FOR EACH WEEK DURING 1908.

WEEK ENDING	FEET.								City Supplied From
	Breed's Pond.		Birch Pond.		Walden Pond.		Hawkes Pond.		
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	
January 4	19	6	22	1	20	11	24	4	Breed's and Birch direct
January 11	20	3	21	6	23	1	20	0	
January 18	20	7	22	1	25	0	13	0	
January 25	20	9	22	6	27	10	14	5	
February 1	20	4	21	8	29	0	18	4	
February 8	19	8	21	1	31	4	17	8	
February 15	18	11	20	4	33	4	13	1	
February 22	18	6	19	9	35	5	12	3	
February 29	18	1	19	4	36	8	9	11	
March 7	17	10	18	11	36	11	12	8	
March 14	17	8	18	6	37	3	14	10	
March 21	17	7	18	3	37	6	16	9	
March 28	17	4	17	11	37	9	18	2	
April 4	16	11	17	5	37	11	19	4	
April 11	16	6	16	9	38	0	20	2	
April 18	16	0	16	2	38	1	20	10	
April 25	15	6	15	7	38	2	21	5	
May 2	14	10	14	11	38	3	21	11	
May 9	14	3	14	3	38	4	22	8	
May 16	14	3	13	11	38	8	23	7	
May 23	13	9	13	3	38	10	24	1	
May 30	13	1	12	6	38	10	24	5	
June 6	12	8	12	7	38	3	24	7	Walden via Birch
June 13	12	7	18	5	35	10	24	0	
June 20	13	3	[illegible]	9	34	7	24	5	
June 27	14	[illegible]	[illegible]	5	33	1	24	3	
July 4	14	9	21	6	31	10	24	1	
July 11	15	4	19	11	31	5	24	0	
July 18	[illegible]	[illegible]	19	11	30	6	23	9	
July 25	[illegible]	3	[illegible]	8	28	10	23	8	
August 1	[illegible]	[illegible]	20	2	28	6	23	7	
August 8	17	[illegible]	18	6	28	4	23	0	
August 15	[illegible]	1	17	4	28	6	23	9	
August 22	[illegible]	[illegible]	15	[illegible]	28	4	23	8	
August 29	[illegible]	[illegible]	14	2	28	3	23	6	
September 5	16	5	12	10	28	2	23	0	Hawkes via Birch*
September 12	16	4	12	10	28	0	21	0	
September 19	15	5	[illegible]	1	27	9	19	0	
September 26	14	5	13	[illegible]	27	7	16	10	
October 3	14	3	17	1	25	11	16	1	Walden via Birch
October 10	14	3	[illegible]	6	23	10	16	1	
October 17	14	[illegible]	[illegible]	6	22	6	16	1	
October 24	15	[illegible]	[illegible]	7	21	8	16	0	
October 31	15	11	[illegible]	7	21	6	16	4	
November 7	16	7	[illegible]	7	20	5	16	10	
November 14	[illegible]	[illegible]	[illegible]	5	19	6	16	11	
November 21	17	7	[illegible]	[illegible]	18	8	17	2	
November 28	17	[illegible]	[illegible]	11	17	11	17	4	
December 5	18	3	21	8	16	8	17	6	
December 12	18	6	[illegible]	11	15	11	19	0	
December 19	18	7	[illegible]	11	15	4	20	11	
December 26	18	6	[illegible]	11	14	7	21	4	

*A little water was supplied from Breed's Pond September 19 to October 10.

Saugus River flowed into Hawkes Pond January 18 to February 19 and December 6 to 16.

TABLE V.

SHOWING THE TOTAL LENGTH IN FEET AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1908.

	6-in.	2-in.	1½-in.	1¼-in.	1-in.	¾-in.	½-in.	Total.
Lynn	95	416	585	680	7,752	4,288	24	13,840
Saugus	. . . .	. . . .	. . . .	191	1,834	229	. . . .	2,254
Total	95	416	585	871	9,586	4,517	24	16,094

TABLE IV.

SHOWING THE AVERAGE DEPTH OF THE WATER IN PONDS FOR EACH WEEK DURING 1908.

WEEK ENDING	FEET.								City Supplied From
	Breed's Pond.		Birch Pond.		Walden Pond.		Hawkes Pond.		
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	
January 4	19	6	24	1	20	11	24	4	Breed's and Birch direct
January 11	20	3	21	6	23	1	20	0	
January 18	20	7	22	1	25	0	13	9	
January 25	20	9	22	6	26	10	14	5	
February 1	20	4	21	8	29	0	18	4	
February 8	19	8	21	1	31	4	17	8	
February 15	18	11	20	4	33	4	13	1	
February 22	18	6	19	9	35	5	12	3	
February 29	18	1	19	4	36	8	9	11	
March 7	17	10	18	11	36	11	12	8	
March 14	17	8	18	6	37	3	14	10	
March 21	17	7	18	3	37	6	16	9	
March 28	17	4	17	11	37	9	18	2	
April 4	16	11	17	5	37	11	19	4	
April 11	16	6	16	9	38	0	20	2	
April 18	16	0	16	2	38	1	20	10	
April 25	15	6	15	7	38	2	21	5	
May 2	14	10	14	11	38	3	21	11	
May 9	14	3	14	3	38	4	22	8	
May 16	14	3	13	11	38	8	23	7	
May 23	13	0	13	3	38	10	24	1	
May 30	13	1	12	6	38	10	24	5	
June 6	12	5	12	7	38	3	24	7	Walden via Birch
June 13	12	7	18	5	35	10	24	6	
June 20	13	3	19	9	34	7	24	5	
June 27	14	0	20	5	33	1	24	3	
July 4	14	9	21	0	31	10	24	1	
July 11	15	1	19	11	31	5	24	0	
July 18	15	0	19	11	30	0	23	9	
July 25	16	3	20	8	28	10	23	8	
August 1	16	10	20	2	28	0	23	7	
August 8	17	0	18	0	28	4	23	6	
August 15	16	11	17	4	28	0	23	9	
August 22	16	6	15	10	28	4	23	8	
August 29	16	5	14	2	28	3	23	6	
September 5	16	5	12	10	28	2	23	0	Hawkes via Birch*
September 12	16	4	12	10	28	0	21	0	
September 19	15	5	13	1	27	0	19	0	
September 26	14	5	13	10	27	7	16	10	
October 3	14	3	17	1	25	11	16	1	Walden via Birch
October 10	14	3	20	6	23	10	16	1	
October 17	14	0	20	6	22	6	16	1	
October 24	15	0	20	7	21	8	16	0	
October 31	15	10	20	7	21	0	16	4	
November 7	16	7	20	7	20	5	16	10	
November 14	17	1	20	5	19	6	16	11	
November 21	17	7	20	6	18	8	17	2	
November 28	17	11	20	11	17	11	17	4	
December 5	18	3	21	8	16	8	17	6	
December 12	18	6	21	11	15	11	19	0	
December 19	18	7	21	11	15	4	20	11	
December 26	18	9	21	11	14	7	21	4	

*A little water was supplied from Breed's Pond September 10 to October 10.

Saugus River flowed into Hawkes Pond January 18 to February 19 and December 6 to 16.

TABLE V.

SHOWING THE TOTAL LENGTH IN FEET AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1908.

	6-in.	2-in.	1½-in.	1¼-in.	1-in.	¾-in.	½-in.	Total.
Lynn	95	416	585	680	7,752	4,288	24	13,840
Saugus	. . . .	. . . .	. . . .	191	1,834	229	. . . .	2,254
Total	95	416	585	871	9,586	4,517	24	16,094

TABLE VI.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝-in.	¾-in.	1-in.	1½-in.	2-in.	3-in.	4-in.	6-in.	Total
Lambert	1,283	1,489	210	39	40	...	...	...	3,061
Trident	752	803	79	4	3	...	...	...	1,641
Thompson	73	188	34	4	...	1	1	...	301
Hersey	79	68	11	...	...	...	...	...	158
Nash	49	14	1	...	1	...	...	...	65
Niagara	25	20	1	...	...	...	...	...	46
Ball and Fitts	13	11	9	...	...	...	...	...	33
Union	2	17	...	5	5	...	8	...	37
Columbia	28	...	...	...	...	...	...	...	28
Empire	11	9	3	4	3	1	1	...	32
Crown	1	5	1	...	...	...	...	...	7
King	1	...	...	...	...	...	...	...	1
Worthington	1	1	...	...	...	...	...	...	2
All others	4	...	1	2	...	2	...	...	9
Total	2,322	2,625	350	58	52	4	10	...	5,421

TABLE VII.

SHOWING THE LOCATION AND SIZE OF GATES SET IN 1907.

STREET.	LOCATION.
Albany	6-inch gate. On the line of the west side of Franklin street, 11 feet, 8 inches north of the south side of Albany street.
Albany	6-inch gate. 2 feet, 8 inches east of the east side of Arlington street, 13 feet 8 inches north of the south side of Albany street.
Albion	1½-inch valve. On the line of the south side of Western avenue, 9 feet, 1 inch east of the west side of Albion street.
Alice avenue	4-inch gate. On the line of the south side of Ingalls street, 8 feet, 9 inches east of the west side of Alice avenue.
Amory	6-inch gate. On the line of the west side of Grove street, 18 feet, 1 inch south of the north side of Amory street.
Arlington	6-inch gate. 8 inches south of the south side of Western avenue, 15 feet, 7 inches west of the east side of Arlington street.
Ashton terrace	2-inch valve. On the line of the west side of Chestnut street, 13 feet, 8 inches north of the south side of Ashton terrace.
Atlantic	6-inch gate. 1 foot north of the north side of Ocean street, 14 feet, 4 inches east of the west side of Atlantic street.
Atlantic	6-inch gate. On the line of the south side of Broad street, 14 feet, 6 inches east of the west side of Atlantic street.
Baltimore	6-inch gate. On the line of the west side of Atlantic street, 15 feet, 9 inches north of the south side of Baltimore street.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Baltimore	6-inch gate. 2 feet, 10 inches east of the east side of Nahant street, 17 feet, 9 inches north of the south side of Baltimore street
Barker's court	6-inch gate. On the line of the east side of Willow street, 16 feet, 7 inches north of the south side of Barker's court.
Barrett	6-inch gate. On the line of the south side of Western avenue, 13 feet, 3 inches west of the east side of Barrett street.
Beacon Hill avenue	6-inch gate. On the line of the east side of Lawton avenue, 18 feet, 3 inches south of the north side of Beacon Hill avenue.
Beacon Hill avenue	6-inch gate. 1 foot, 3 inches east of the west side of Beede avenue, 17 feet, 5 inches south of the north side of Beacon Hill avenue.
Beckford court	1½-inch valve. 1 foot east of the east side of Beckford court, 33 feet, 7 inches north of the south side of Beckford court.
Belvidere place	1½-inch valve. On the line of the south side of Western avenue, 8 feet, 8 inches east of the west side of Belvidere place.
Board of Health rd.	6-inch gate On the line of the north side of Sea street extention, 9 feet, 10 inches west of the east side of the Board of Health road.
Board of Health rd.	6-inch gate On the line of the south side of Sea street extention, 10 feet, 4 inches west of the east side of the Board of Health road.
Boston street	10-inch gate. On the line of the east side of North Franklin street, 21 feet, 3 inches south of the north side of Boston street.
Boston	6-inch gate. On the line of the east side of North Federal street, 23 feet, 9 inches south of the north side of Boston street.
Bowman avenue	6-inch gate. On the line of the north side of Broad street, 6 feet, 10 inches east of the west side of Bowman avenue.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Breed	8-inch gate. 7 inches north of the north side of Ocean street, 11 feet, 2 inches east of the west side of Breed street.
Breed	8-inch gate. On the line of the south side of Lewis street, west of Breed street, 18 feet, 9 inches east of the west side of Breed street.
Brimblecomb	6-inch gate. On the line of the south side of Western avenue, 18 feet, 8 inches west of the east side of Brimblecomb street.
Brimblecomb	6-inch gate. On the line of the north side of Baker street, 13 feet, 2 inches west of the east side of Brimblecomb street.
Broad-street place	2-inch valve. On the line of the south side of Broad street, 8 feet, 11 inches east of the west side of Broad-street place.
Brooklawn	6-inch gate. On the line of the north side of Western avenue, 16 feet, 2 inches east of the west side of Brooklawn.
Chase	4-inch gate. On the line of the north side of Hanover street, 15 feet, 5 inches east of the west side of Chase street.
Chestnut	10-inch gate. On the line of the south side of Union street, 43 feet, 9 inches east of the west side of Chestnut street.
Chestnut	10-inch gate. 1 foot east of the east side of Chapman place, 14 feet, 11 inches north of the south side of Chestnut street.
Chestnut	10-inch gate. On the line of the north side of Lewis street, 17 feet, 2 inches west of the east side of Chestnut street.
Clifton, Wyoma	2-inch valve. On the line of the southwest side of Sluice Road, 14 feet, 6 inches southeast of the north-west side of Clifton street
Clifton avenue	6-inch gate. On the line of the west side of Jackson street, 9 feet 9 inches north of the south side of Clifton avenue.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Collins............	[illegible]-inch gate. On the line of the east side of Chestnut street, [illegible] feet, [illegible] inches north of the south side of Collins street.
Collins............	[illegible]-inch gate. On the line of the west side of Chatham street, north of Collins street, 17 feet, 7 inches north of the south side of Collins street.
Commercial.......	[illegible]-inch gate. 2 feet 6 inches north of the north side of Sea street extension, 15 feet, 7 inches west of the east side of Commercial street.
Electric place......	6-inch gate. On the line of the south side of Watermill street, 13 feet, 5 inches west of the east side of Electric place.
Essex terrace......	12-inch valve. On the line of the south side of Essex street, 12 feet, 6 inches east of the east side of 368 Essex street.
Endicott	6-inch gate. On the line of the east side of Franklin street, 10 feet, 5 inches south of the north side of Endicott street.
Fayette	[illegible]-inch gate. On the line of the north side of Collins street, 12 feet, 2 inches west of the east side of Fayette street.
Fernwood ..	[illegible]-inch valve. On the line of the east side of Endicott avenue, [illegible] feet, 5 inches north of the south side of Fernwood street.
Fisk	[illegible]-inch gate. [illegible] feet, [illegible] inches south of the north side of Marianna street, 12 feet, 2 inches west of the east side of Fisk.
First	[illegible]-inch gate. On the line of the south side of Locust, [illegible] feet, [illegible] inches west of the east side of First street.
Franklin	[illegible]-inch gate. [illegible] feet, 4 inches south of the north side of Baker street, 18 feet, 8 inches east of the west side of Franklin street.
Franklin	[illegible]-inch gate. On the line of the south side of Western avenue, [illegible] feet, 10 inches east of the west side of Franklin street.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Franklin............	12-inch gate. 8 inches south of the north side of Western avenue, 13 feet, 4 inches east of the west side of Franklin street.
Franklin...........	12-inch gate. 3 feet, 6 inches north of the north side of 200 Franklin street, 22 feet, 9 inches east of the east side of 200 Franklin street.
Fuller court........	1½-inch valve. On the line of the east side of Fuller street, 14 feet, 8 inches north of the south side of Fuller court.
Gardiner..........	6-inch gate. On the line of the west side of Myrtle street north of Gardner, 30 feet 0 inches south of the north side of Gardner street.
Garland...........	6-inch gate. On the line of the east side of Cherry street, 18 feet, 8 inches north of the south side of Garland street.
Garland...........	6-inch gate. On the line of the west side of Bassett street, 22 feet, 8 inches south of the north side of Garland street.
Greenwood place ..	4-inch gate. On the line of the south side of Essex street, 6 feet, 0 inches west of the east side Greenwood place.
Grove	6-inch gate. On the line of the north side of Boston street, 20 feet, 10 inches west of the east side of Grove street.
Grove.............	6-inch gate. On the line of the south side of Salem street, 33 feet, 5 inches east of the west side of Grove street.
Hanover...........	8-inch gate. On the line of the east side of Franklin street, 17 feet, 0 inches north of the south side of Hanover street.
Hanover...........	8-inch gate. On the line of the west side of Johnson street, 15 feet, 9 inches north of the south side of Hanover street.
Hanover	8-inch gate. On the line of the east side of Johnson street, 15 feet, 6 inches north of the south side of Hanover street.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Hanover	6-inch gate. On the line of the north side of North Common street, 21 feet, 7 inches west of the east side of Hanover street.
Harbor	8-inch gate. On the line of the east side of Shepard street, 14 feet, 4 inches south of the north side of Harbor street.
Harbor	8-inch gate. 8 inches east of the west side of Blossom street, 15 feet, 11 inches south of the north side of Harbor street.
Harbor	8-inch gate. On the line of the east side of Blossom street, 16 feet, 1 inch south of the north side of Harbor street
Harbor	8-inch gate. 1 foot west of the west side of Pleasant street, 12 feet, 6 inches south of the north side of Harbor street.
Harrison court	8-inch gate. On the line of the east side of Market street, 12 feet, 0 inches north of the south side of Harrison court.
Holly avenue	4-inch gate. On the line of the northwest side of Lynnfield street, 21 feet, 10 inches northeast of the southwest side of Holly avenue.
Hood	6-inch gate. On the line of the west side of Spenser street, 17 feet, 8 inches south of the north side of Hood street.
Hood	6-inch gate. 11 inches west of the east side of Cottage street, 14 feet, 5 inches south of the north side of Hood street.
Hovey	4-inch gate. On the line of the east side of Breed street, 2 feet, 0 inches south of the north side of Hovey place.
Howard	6-inch gate On the line of the east side of Green street, 13 feet, 0 inches north of the south side of Howard street.
Howard	6-inch gate. On the line of the west side of Chestnut street, south of Howard, 13 feet 6 inches north of the south side of Howard street

TABLE VII. — *Continued.*

STREET.	LOCATION.
Intervale	6-inch gate. On the line of the north side of Atkins avenue, 16 feet 0 inches, west of the east side of intervale street
Jackson	8-inch gate On the line of the south side of Marianna street, 16 feet, 7 inches east of the west side of Jackson street.
Jackson	8-inch gate. 10 inches south of the north side of Ingalls street, 16 feet, 1 inch east of the west side of Jackson street.
Jackson	8-inch gate. On the line of the north side of Essex street, 15 feet, 0 inches east of the west side of Jackson street.
Joint place	4-inch gate. On the line of the east side of Jackson street, 8 feet, 7 inches south of the north side of Joint place.
Lafayette park	8-inch gate. On the line of the curb or the north side of park in front of No. 80, 65 feet, 9 inches southeast of division line between No. 74 and 380, and 45 feet, 6 inches south of the north side of Lafayette park.
Lafayette park	6-inch gate. 17 feet 6 inches west of the division line between No. 80 and 86 Lafayette park, 13 feet, 0 inches south of the north side of Lafayette park
Lafayette park	6-inch gate. 2 feet, 3 inches west of the division line between 48 and 58 Lafayette park, 15 feet, 0 inches, north of the south side of Lafayette park.
Lander	6-inch gate. 4 inches south of the south line of Howard street, 13 feet, 4 inches west of the east line of Lander street.
Lincoln	6-in gate. On the line of the north side of Union street, 11 feet, 9 inches west of the east side of Lincoln street.
Locust place	4-inch gate. 1 foot, 0 inches east of the east side of Chestnut street, 12 feet, 10 inches south of the north side of Locust place

TABLE VII. — *Continued.*

STREET.	LOCATION.
Maple	8-inch gate On the line of the east side of Chatham street, 18 feet, o inches south of the north side of Maple street.
Mace place	4-inch gate. On the line of the east side of Breed street, 14 feet, 4 inches south of the north side of Mace place.
Mailey.............	6-inch gate. On the line of the south side of Union street, 15 feet, 5 inches west of the east side of Mailey street.
Maple	8-inch gate. On the line of the east side of Euclid avenue, 36 feet, 6 inches south of the north side of Maple street
Marianna..........	6-inch gate. On the line of the east side of Fayette street, 16 feet, 1 inch north of the south side of Marianna street.
Marianna.........	6-inch gate. On the line of the west side of Chatham street, 11 feet, 4 inches north of the south side of Marianna street.
Marianna..........	8-inch gate. o inches east of the east side of Chatham street, 19 feet, 2 inches north of the south side of Marianna street.
Marianna..........	8-inch gate. 6-inches east of the west side of Jackson street, 14 feet, 10 inches north of the south side of Marianna street.
Mason.............	6-inch gate 5 feet, 11 inches west of the east side of Chestnut street, 14 feet, o inches north of the south side of Mason street
Meadow court	2-inch valve. On the line of the north side of Springvale avenue, 10 feet, o inches east of the west side of Meadow court.
Moulton	6-inch gate. On the line of the north side of Boston street, 16 feet, 4 inches west of the east side of Moulton street.
Moulton	6-inch gate. On the line of the south side of Walnut street, 16 feet, 4 inches west of the east side of Moulton street.

TABLE VII. — *Continued.*

STREET.	LOCATION.
Mystic avenue.....	4-inch gate. 6-inches south of the south side of Maple street, 12 feet, 9 inches east of the west side of Mystic avenue.
Nelson............	6-inch gate. On the line of the south side of Nelson street, 34 feet, 0 inches east of the west side of Nelson street.
Nichols............	6-inch gate. On the line of the west side of Cherry street, 15 feet, 2 inches south of the north side of Nichols street.
N. Common ter....	2-inch valve. On the line of the north side of North Common street, 6 feet, 6 inches east of the east side of house 79 and 81.
Olive.............	8-inch gate 1 foot, 8 inches east of the east side of Chestnut street, 16 feet, 0 inches north of the south side of Olive street.
Park...............	6-inch gate. 2 feet, 8 inches north of the north side of North Common street, 24 feet east of the west side of Park street.
Park..	6-inch gate. 9 inches south of the south side of Western avenue, 31 feet, 0 inches west of the east side of Park street.
Park	6-inch gate. 7 inches south of the north side of Western avenue, 34 feet, 10 inches west of the east side of Park street
Park	6-inch gate. 3 feet, 3 inches north of the south side of Boston street, 20 feet, 2 inches east of the west side of Park street.
Pikes court........	2-inch valve. On the line of the south side of Western avenue, 5 feet, 0 inches east of the west side of Pikes court.
Portland	6-inch gate. On the line of the north side of Baltimore street, 15 feet, 9 inches west of the east side of Portland street
Portland	6-inch gate. On the line of south side of Broad street, 15 feet, 9 inches west of the east side of Portland street.

TABLE [illegible] — Continued.

STREET.	LOCATION.
[illegible]	[illegible] inches east of the west side of [illegible] street, [illegible] feet [illegible] inches north of the south side of [illegible] street.
[illegible]	[illegible] on the line of the north side of [illegible] street, [illegible] feet [illegible] inches east of the west side of [illegible] street.
[illegible]	[illegible] inches north of the south side of [illegible] street, [illegible] feet [illegible] inches east of the west side of [illegible] street.
[illegible]	[illegible] on the line of the south side of [illegible] street, [illegible] feet [illegible] inches east of the west side of [illegible] street.
[illegible]	[illegible] on the line of the west side of [illegible] street, [illegible] feet [illegible] inches south of the north side of [illegible] street.
[illegible]	[illegible] on the line of the west side of [illegible] street, [illegible] feet [illegible] inches south of the north side of [illegible] street.
[illegible]	[illegible] inches east of the east side of [illegible] street, [illegible] feet [illegible] inches south of the [illegible] street extension.
[illegible]	[illegible] the center of the second [illegible] Pleasant street, [illegible] feet south [illegible]
[illegible]	[illegible] fifth telegraph pole [illegible] feet [illegible] inches [illegible]
[illegible]	[illegible] the east side of [illegible] inches south of the [illegible] street.
[illegible]	[illegible] the east side of [illegible] inches north of the south [illegible]
[illegible]	[illegible] of the west side of [illegible] inches south of the [illegible]

TABLE VII. — *Continued.*

STREET.	LOCATION.
Stephen court......	4-inch gate. On the line of the south side of Stephen street, 7 feet 6 inches east of the west side of Stephen court.
Strawberry avenue.	6-inch gate. 1 foot west of the west side of Franklin street, 8 inches south of the north side of Strawberry avenue.
Thompson court...	4-inch gate On the line of the east side of Chestnut street, 10 feet, of inches south of the north side of Thompson court.
Union court	6-inch gate. On the line of the north side of Union street, 9 feet, 9 inches west of the east side of Union court.
Vine	8-inch gate. 1 foot, 6 inches north of the north side of Summer street, 14 feet, 10 inches east of the west side of Vine street.
Vine	8-inch gate. 1 foot, 11 inches north of the south side of South Common street, 13 feet, 10 inches east of the west side of Vine street.
Warren............	6-inch gate. 1 foot west of the east side of Elm street, 13 feet, 10 inches south of the north side of Warren street.
Warren............	6-inch gate. On the line of the west side of Commercial street, 17 feet, of inches south of the north side of Warren street.
Warren	6-inch gate. On the line of the east side of Vine street, 16 feet, 1 inch north of the south side of Warren street.
Warren	6-inch gate. On the line of the west side of Sheppard street, 13 feet, 8 inches north of the south side of Warren street.
Warren place......	4-inch gate. On the line of the south side of Warren street, 9 feet, 11 inches east of the west side of Warren place.
Waterhill..........	[illegible] gate On the line of the west side of Federal street 13 feet north of the south side of Waterhill street

TABLE VII. — *Continued.*

STREET.	LOCATION.
West Baltimore....	6-inch gate. On the line of the east side of Newhall street, 17 feet, 3 inches north of the south side of West Baltimore street.
Whittier...........	6-inch gate. On the line of the south side of Hanover street, 9 feet, 9 inches east of the west side of Whittier street.

TABLE VIII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN [illegible]

STREET.	FROM	TO	Taken out	Size Inches and Length Laid Feet.						
				4	6	8	10	12	16	Total
Arlington*	Western av.	Baker	4		[illegible]					[illegible]
Atlantic*	Broad	Ocean	6		[illegible]					[illegible]
Baltimore*	Atlantic	Nahant	6		1,150					[illegible]
Barrett‡	Western av.				411					[illegible]
Be'c'n H'l av*	Lawton av.	Beede av.			101					[illegible]
Breed*	Lewis	Ocean	4			[illegible]				[illegible]
Brimbl'comb*	Western av.	Baker	4		308					[illegible]
Broad‡		Sorosis An'x				78				[illegible]
Broad‡		Bowman av.			84					[illegible]
Bowler*	Chestnut	Ford	4		970					[illegible]
Chestnut*	Essex	Lewis	6				4,100			[illegible]
Collins*	Chestnut	Chatham	6			1,110				[illegible]
Franklin*	Leighton	Boston	6					[illegible]		[illegible]
Ford*	Bowler	Maple	4		775					[illegible]
Garland*	Cherry	Bassett	4		450					[illegible]
Greenw'd ter‡	Essex			140						[illegible]
Grove*	Boston	Linwood rd.	6		1,080					[illegible]
Hanover*	Franklin	Washington	1½, 4			888				[illegible]
Harbor*	Shepard	Pleasant	6			1,044				[illegible]
Harrison ct‡	Market					107				[illegible]
Hood*	Cottage	Spencer	4		[illegible]					[illegible]
Howard*	Green	Chestnut	4		965					[illegible]
Intervale†	Atkins av.		4		384					[illegible]
Jackson*	Marianna	Essex	6			[illegible]				[illegible]
Kenwood ter*	Lewis		4		[illegible]					[illegible]
Lafayette pk*	Lewis	R. R. bridge	6, 4		[illegible]	[illegible]				[illegible]
Lincoln*	Essex	Union	4		[illegible]					[illegible]
Lovett pl*	Lewis		1½	414						[illegible]
Madison†	End of pipe	Ware		144						[illegible]
Maple*	Chatham	Euclid av.	6			[illegible]				[illegible]
Marianna*	Fayette	Chatham	4		[illegible]					[illegible]
Marianna*	Chatham	Jackson	6			[illegible]				[illegible]
Mason*	Chestnut	Fayette	6		[illegible]					[illegible]
Moulton*	Walnut	[illegible]	4		[illegible]					[illegible]
No. Fedral*	Boston	[illegible]	6						[illegible]	[illegible]
N. F'k'n st. ct.*	N. Franklin	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
Olive*	[illegible]	[illegible]	4			[illegible]				[illegible]
Park*	[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
Portland*	[illegible]	[illegible]	4		[illegible]					[illegible]
Rand*	[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
Red Rock*	Ocean	[illegible]	4		[illegible]					[illegible]
River*	[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
Sagamore*	[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
Sea [illegible]								[illegible]		[illegible]
Stephen*	[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
Union ct.*	[illegible]		[illegible]		[illegible]					[illegible]
Vine*	[illegible]	[illegible]	[illegible]			[illegible]				[illegible]
Warren*	Elm	Commercial	[illegible]		[illegible]					[illegible]
Warren*	Vine	[illegible]	[illegible]		[illegible]					[illegible]
Waterhill*	[illegible]	[illegible]	[illegible]				[illegible]			[illegible]
W. Baltimore*	Nahant	[illegible]	[illegible]		[illegible]					[illegible]
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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*[illegible]

†Pipe extended [illegible]

[illegible] [illegible]

Total length [illegible] [illegible]

Total length [illegible] [illegible]

Total length [illegible] [illegible]

Total length [illegible] [illegible]

Total length [illegible] [illegible]

Total length [illegible] [illegible]

TABLE II.

[illegible] PIPES LAID IN [illegible]

	Size and Length.			
	[illegible] in.	[illegible] in.	[illegible] in.	Total.
[illegible] street			[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]
[illegible] place		[illegible]		[illegible]
[illegible]		[illegible]		[illegible]
[illegible]		[illegible]		[illegible]
[illegible] street		[illegible]	[illegible]	[illegible]
[illegible]		[illegible]		[illegible]
[illegible] street			[illegible]	[illegible]
[illegible]		[illegible]		[illegible]
[illegible]			[illegible]	[illegible]
[illegible]			[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]
[illegible]			[illegible]	[illegible]
[illegible]			[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE X.

SHOWING KIND, SIZE AND LOCATION OF HYDRANTS SET IN 1908.

Arlington street, between 9 and 13	6 Ludlow
Atlantic street, between 7 and 11	6 Walker
Atlantic street, between 43 and 51	6 Walker
Atkins avenue, between 40 and 42	*6 Walker
Adams street, corner Sheridan street	*6 Walker
Baltimore street, between 48 and School street	6 Ludlow
Bowler street, between 119 and 123	6 Walker
Brimblecomb street, between 25 and 29	6 Ludlow
Berkeley street, front of 41	6 Ludlow
Broad street, between 150 and 152	8 Walker
Broad street, corner of Farrar	*6 Walker
Broadway, Peabody line	*6 Walker
Breed street, between 51 and 53	*6 Ludlow
Breed street, between 33 and 37	*6 Ludlow
Beacon Hill avenue and Lawton avenue	6 Walker
Barrett street, corner Western avenue	6 Walker
Boulevard, near gas house road	6 Ludlow
Boulevard, opposite J. B. & W. A Lamper	6 Ludlow
Collins street, corner Collins terrace	6 Walker
Chestnut street, between 97 and 103	6 Ludlow
Chestnut street, corner of Thompson court	6 Walker
Chestnut street, between 57 Chestnut and 58 Lafayette park	6 Chapman
Central square, between 31 and 33	8 Walker
Colonial avenue, end of pipe	*6 Boston
Exchange street, front of North Shore News	8 Ludlow
Essex street, corner Stewart	*6 Ludlow
Franklin street, corner Baker	6 Ludlow
Franklin street, corner Hanover	*6 Ludlow
Franklin street, between 51 and 55	6 Ludlow
Franklin street, between 19 and 23	6 Ludlow
Franklin street, between 30 and school house	*6 Ludlow
Howard street, corner of Lander	6 Walker
Harbor street, front of 25	**6 Walker
Harbor street, between 59 and 61	6 Ludlow
Harbor street, between 105 and 107	6 Ludlow
Hanover street, corner of Whittier	6 Ludlow
Hood street, between 31 and 33	6 Ludlow

Hudson square, between 715 and 717 and Boston street	*6 Walker
Harrison court, front of 25	6 Walker
Holly avenue, end of pipe	6 Boston
Intervale street, at end of pipe	4 Holyoke
Jackson street between 26 and 32	6 Holyoke
Jackson street, between 40 and 46	6 Walker
Jackson street, corner of Clifton ave	6 Walker
Kenwood terrace, at the bend	6 Ludlow
Lincoln street, corner of Union	6 Ludlow
Lafayette park, between 10 and 23	6 Walker
Lafayette park, front of 86	6 Walker
Linden street, corner of Morris	6 Walker
Lovett place, end of pipe	6 Holyoke
Mariana street, between 85 and 89	6 Walker
Munroe street, front of 42	6 Walker
Munroe street, front of 26	6 Walker
Munroe street, front of 75	6 Walker
North Common street, front of 39	*6 Walker
North Federal street, between 15 and 19	6 Walker
North Federal street, between 51 and 55	6 Ludlow
Newhall street, corner of Amity street	6 Ludlow
Olive street, front of 18	6 Ludlow
Park street, between 86 and 90	6 Ludlow
Park street, between 36 and 40	6 Ludlow
Portland street, between 18 and 32	6 Walker
Pleasant street, [illegible]	8 Walker
Pleasant street, near B. & B. & A. [illegible] R. R.	6 Walker
Red Rock street, corner of Ocean street	6 Walker
Rand street, between [illegible]	6 Walker
Sagamore street, between [illegible]	**6 Walker
Sagamore street, front of 33	6 Boston
Summer street, [illegible] Hotel W[illegible]	8 Walker
Summer street, front of 12[illegible]	6 Walker
Summer street, front of 31	**6 Car
Springvale avenue, end of pipe	6 Walker
Springvale avenue, front of [illegible]	**6 Boston
Spencer street, corner of [illegible]	*6 Ludlow
Spencer street, by B. & M. R. R.	6 Walker
Union street, front of [illegible]	8 Walker
Union street, front of 27[illegible]	8 Walker
Union court and [illegible] place	6 Walker
Vine street, between 2[illegible] and 28	6 Holyoke
Warren street, between [illegible] and [illegible]7	6 Ludlow
Warren street, corner of Warren place	6 Walker
Waterhill street, 70 feet from Federal street	6 Ludlow

Western avenue, opposite West [illegible] Hotel	[illegible]
Western avenue, near [illegible] court	[illegible]
Western avenue, front of [illegible]	[illegible]
Western avenue, front of [illegible]	[illegible]
Western avenue, corner of [illegible]	[illegible]
West Baltimore street, between [illegible] and [illegible]	[illegible]
Washington street, front of [illegible]	[illegible]
Washington street, front of [illegible]	[illegible]
Total	[illegible]

*Removed.

**[illegible]

Flow of Water Over Weirs, Foot of Birch Pond Dam, and Hawkes Pond Dam.

(Gallons per 24 Hours.)

Date 1908	Birch Pond Depth of Pond Ft. In.	Birch Pond Weir	Hawkes Pond Depth of Pond Ft. In.	Hawkes Pond Weir
February [illegible]	[illegible]	123,150	14-01	55,070
February [illegible]	[illegible]	[illegible]	12-[illegible]	77,750
February 23	[illegible]	123,150	10-03	58,070
April 4	[illegible]	[illegible]	10-02	100,478
April 13	[illegible]	58,085	20-08	112,280
April 21	[illegible]	[illegible]	21-07	112,280
May [illegible]	[illegible]	[illegible]	22-0[illegible]	124,547
May 8	[illegible]	[illegible]	22-08	102,3[illegible]
May 22	[illegible]	[illegible]	24-03	103,012
June [illegible]	[illegible]	4,3[illegible]	24-07	150,300
June [illegible]	[illegible]	[illegible]	24-0[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	24-[illegible]4	[illegible]
[illegible]	[illegible]	[illegible]	24-[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	23-[illegible]	Removed
[illegible]	[illegible]	[illegible]	23-[illegible]	
[illegible]	[illegible]	[illegible]	23-[illegible]	
[illegible]	[illegible]	[illegible]	23-[illegible]	
[illegible]	[illegible]	[illegible]	23 [illegible]	
[illegible]	[illegible]	[illegible]	23-[illegible]4	
[illegible]	[illegible]	[illegible]	23-[illegible]4	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	

Flow of Water Over Weirs Foot of Walden Pond Dam.

(Gallons per 24 Hours.)

Date [illegible]	Dept of Pond. Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
February 11	[illegible]	[illegible]	1,758	2,863	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February 16	[illegible]	112,174	2,793	636	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February 27	[illegible]	[illegible]	2,793	954	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March 13	[illegible]	[illegible]	1,758	2,863	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March 24	[illegible]	[illegible]	1,758	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April 4	[illegible]	[illegible]	3,527	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April [illegible]	[illegible]	[illegible]	[illegible]	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April 24	[illegible]	[illegible]	2,763	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May [illegible]	[illegible]	[illegible]	2,763	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May [illegible]	[illegible]	[illegible]	2,763	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May 22	[illegible]	[illegible]	[illegible]	3,923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

See page [illegible] for diagram showing position of Weirs.

REPORT OF CHIEF INSPECTOR.

LYNN, MASS., January 25, 1909.

To the Public Water Board:

GENTLEMEN,—I have the honor to report the following as to what has been accomplished by the inspectors for the past ten months, March 1, 1908 to January 1, 1909.

Houses inspected in Lynn	19,210
Houses inspected in Saugus	1,958
Meters read	44,766
Water bills delivered	18,000
Meter bills delivered	15,500
Meter notices issued	850
Leak notices issued	1,052

The following new and additional fixtures have been reported.

183 families, 364 faucets, 99 set tubs.
198 bath tubs, 331 water-closets, 37 heaters.
203 horses, 35 cows.

Respectfully submitted,

J. F. POOL,

Chief Inspector.

SUMMARY OF STATISTICS.

FOR THE YEAR ENDING DECEMBER 31, 1908.

In form recommended by the New England Water Works Association.

LYNN WATER WORKS, LYNN, ESSEX CO., MASS.

GENERAL STATISTICS.

Population by census of 1908, Lynn and Saugus,	85,300
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and Saugus river
Mode of supply,	Pumping to reservoir and stand pipe.

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a.* Kind, soft coal
   - *b.* Brand of coal used, Georges Creek.
   - *c.* Average price of coal per gross ton, delivered, $4.35.
   - *d.* Percentage of ash, 12.66
   - *e.* Wood, price per cord
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,605,900	95,900	1,800

		Loretz.	Leavitt.	Auxiliary.
4.	[Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,		none.	
4*a*.	Amount of other fuel used,		none.	
5.	Total equivalent coal consumed for the year =(3)+(4), in pounds,	3,605,900	95,900	1,800
6.	Total pumpage for the year, in gallons, with allowance for slip,	2,171,814,750	65,526,800	302,325
7.	Average static head against which pumps work, in feet,	146.45	153 88	214.47
8.	Average dynamic head against which pumps work, in feet,	148.32	154.38	215.47
9.	Number of gallons pumped per pound of equivalent coal (5),	602.3	683.3	168.

10. $$\text{Duty} = \frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5).}}$$

Loretz.	Leavitt.	Auxiliary.
74,503,189	87,974,628	30,182,445

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

11. Per million gallons pumped,
12. Per million gallons raised one foot (dynamic),

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Fr Fr Tc Fr Ba

	Loretz.	Leavitt.	Auxiliary.
4. [Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,		none.	
4*a*. Amount of other fuel used,		none.	
5. Total equivalent coal consumed for the year =(3)+(4), in pounds,	3,605,900	95,900	1,800
6. Total pumpage for the year, in gallons, with allowance for slip,	2,171,814,750	65,526,800	302,325
7. Average static head against which pumps work, in feet,	146.45	153.88	214.47
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Loretz.	Leavitt.	Auxiliary.
74,503,189	87,974,628	30,182,445

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

11. Per million gallons pumped,

12. Per million gallons raised one foot (dynamic),

Fr
Fr
Tc
Fr
Ba

FINANCIAL STATISTICS.

RECEIPTS.			EXPENSES.		
From meter rates	$146,489.56		Maintenance	$174,324.13	
From fixture rates	114,168.16		Interest	67,952.50	
			Sinking funds	25,657.30	
Total water rates		$260,657.72	Rebate to Saugus	6,913.95	
From other sources		14,220.16	Construction	3,605.50	
Balance from 1907 construction		6,650.40	Balance to construction	3,044.90	
		$281,528.28			$281,528.28

Net cost of works to, date	$2,966,645.63
Bonded debt to date, ...	1,768,500.00
Value of Sinking Fund, ...	538,694.08

Average rate of interest, $3\frac{3}{4}$ per cent.

STATISTICS OF CONSUMPTION OF WATER.

1.	Estimated population at date.	85,300
2.	Estimated population on lines of pipe.	85,300
3.	Estimated population supplied.	85,300
4.	Total consumption for the year (gallons).	2,233,331,153
5.	Passed through meters (gallons).	895,732,460
6.	Percentage of consumption metered.	40 per cent
7.	Average daily consumption in gallons.	6,118,564
8.	Gallons per day to each inhabitant.	71.73
9.	Gallons per day to each consumer.	71.85
10.	Gallons per day to each tap.	431.94
11.	Cost of supplying water, per million gallons, figured on total maintenance (item CC).	$75.00
12.	Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds.	$106.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1.	Kind of pipe.	Cement-lined, and cast-iron.
2.	Sizes.	From 36 to 4 inch.
3.	Extended (length of pipe in feet).	1,193

4. Renewed during year (feet),	38,916
5. Total now in use (miles),	140
6. Cost of repairs per mile,	$60.00
7. Number of leaks per mile,	.075
8. Length of pipes less than 4 inches diameter (miles),	Courts only
9. Number of hydrants added during year	72
10. Number of hydrants (public and private), now in use,	1,089
11. Number of stop gates added during year,	134
12. Number of stop gates now in use,	1,241
13. Number of stop gates smaller than 4-inch,	70
14. Number of blow-offs,	67
15. Range of pressure on mains (pounds),	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	16,094
19. Discontinued (feet),	800
20. Total now in use (miles),	115
21. Number of service taps added during year,	331
22. Number now in use,	14,501
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	604

26. Number now in use,	5,421
27. Percentage of services metered,	40 per cent.
28. Percentage of receipts from metered water (B ÷ C),	55 per cent.
29. Number of motors and elevators added,	1
30. Number now in use,	5

REPORT OF WILLIAM S. JOHNSON.

BOSTON, July 25, 1908.

Public Water Board, Lynn, Mass.:

GENTLEMEN,—Herewith is submitted a summary of the observations which have been made during the past year of the leakage from the different storage reservoirs of the Lynn Water Works.

Walden Pond.

At the time when the observations of the leakage from Walden pond were begun the level of the water on the gauge was 29 feet 7 inches or 7 feet 5 inches below nominal high water. At this time there were two distinct streams flowing at the base of the dam near its northerly end and a large stream was flowing from the tile drain which collects the water from the ground below the dam at its southerly end. There was also a stream of water issuing from the dam near the southerly end some distance up on the slope. These were the only distinct streams, but water was oozing out all along the foot of the slope in the vicinity of the center of the dam. The brook which drains the meadow immediately below the dam, and which must receive all of the leakage, was flowing a good stream.

Weirs were placed on the two streams at the northerly end of the dam, upon the drain which collects the water from the southerly end and on the stream which issued from the slope at the southerly end of the dam. In order to get an idea as to the seepage through the dam near the center, trenches from 30 to 45 feet in length were dug at the foot of the slope, the bottom of the trenches being somewhat above the natural surface of the meadow and weirs were placed at the outlets of these trenches so that the flow of each from them could be ascertained. A weir was also placed on the brook at an old dam across the meadow about 700 feet below the Walden pond dam. Frequent measurements have been made of the flow at each of these weirs since early in August, 1907.

The main stream, which was measured at the old dam, receives water from a small water-shed besides the water which comes from Walden pond and immediately after a rain the flow at this point is increased by the run-off from this water-shed. The northerly weir, designated as weir No. 8, also receives some water at times of wet weather from a small water-shed and it is possible that the drain at the base of the dam at its southerly end receives some water besides that which comes from the pond. It is probable that the other streams which are measured receive very little water which does not come from the reservoir, except during or immediately after a rain, when the water falling on the slope of the dam may find its way down the slope and into the streams.

During the observations the level of the water in Walden pond has fallen to about 17 feet below high water and early in June it had risen to one foot, ten inches above the normal high water mark The flow of the stream at the old dam where all of the leakage must pass has varied from 250,000 gallons to 800,000 gallons per day and omitting those measurements which were made when the flow was obviously affected by rains the fluctuations in the flow of the brook at this point follow very closely the fluctuations in the height of water in Walden pond, indicating that the water from the pond forms a large proportion of the flow of the brook.

The stream which issues from the southerly end of the dam some way up on the slope shown on the map as No. 6, disappeared when the water in the pond was drawn down to about 25 feet on the gauge and did not reappear until the water returned to this level in the fall. At the highest stage of the water in the pond this stream was flowing about 10,000 gallons per day.

The seepage along the bottom of the dam collected in the trenches varies with the height of the water in the reservoir, but the increase in flow with increased height is much greater when the reservoir is nearly full than when the water is at a low level.

None of the streams issuing from the dam or its vicinity has been muddy, except for occasional periods when the reservoir was being filled for the first time. These periods of muddy water were of short duration and the water soon became clear, indicating that there is no washing away of the material inside of the dam This fact, together with the distribution of the leakage over practically the entire length of the dam indicates that there is no reason to fear for the safety of the structure.

It is likely that some of the smaller leaks will in time be reduced by a deposit of silt, but it is not likely that the quantity of water lost from the reservoir will be diminished materially.

The bearing of the leakage from the dam upon the possibility of raising the height of the dam is important, since it is evident that by raising the dam 20 feet, as at first proposed, the leaks will be greatly increased.

A summary of the observations on the different weirs at Walden pond is given in the accompanying table, those readings taken immediately after a storm being omitted. The accompanying diagram shows graphically the relation of the flow over the principal weirs to the height of water in the pond and the effect of rainfall.

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Birch Pond.

The principal part of the leakage from Birch pond occurs at the Walnut street end and is collected in a drain discharging into a brook below the dam. The flow from this drain has been measured since the middle of September, 1907, and the results are given in the accompanying table. When the reservoir is full the flow from the drain is about 212,000 gallons per day and in addition there is a considerable quantity of water which does not enter the drain and was not measured. This leakage has undoubtedly continued ever since the dam was constructed and no serious results have ensued.

The length of the Birch pond dam is small in comparison with the length of Walden pond dam and in proportion to the length and height of the dam the leakage from Birch pond is much greater than the leakage from Walden pond.

Flow Over Weir Below Birch Pond Dam.

Date. 1907.	Height of Water in Pond (Feet and inches)	Flow over Weir. (Gallons per day)
September 17	18-4	151,000
September 26	18-1	101,500
October 4	14-0	71,400
October 11	14-4	98,700
October 24	12-1	9,500
October 31	11-1	5,250
November 15	9-6	9,500
November 23	8-9½	4,530
December 3	18-3½	157,800
December 19	20-9½	160,000
December 26	22-5½	210,000
1908.		
January 1	21-8	[illegible]
January 2	22-0	214,500
February 7	20-10	137,000
February 17	19-10¾	127,000
March [illegible]	18-7	[illegible]
March 24	17-11	86,7[illegible]
April 13	16-3	55,100
April 21	15-8	43,000
April 2[illegible]	14-11	[illegible]
May 7	14-0	15,7[illegible]
May 1[illegible]	13-5	24,000
June 2	11-8	4,820
June 18	18-8	150,800
June 25	21-8	210,000
July 14	19-11	144,900
July 21	20-7	175,300

Hawkes Pond.

A weir has been constructed below the Hawkes pond dam over which a large portion of the leakage passes. The results of the readings of this weir are given in the following table:

Flow Over Weir Below Hawkes Pond Dam.

Date.	Height of Water (Feet and inches)	Flow over Weir. (Gallons per day)
1907.		
November 8	18-0	62,500
November 15	19-5	70,500
November 23	20-4	70,000
November 30	23-6	134,000
December 9	24-5	110,500
December 19	25-2	115,200
December 26	25-6½	135,000
1908.		
January 4	22-7	110,500
January 11	17-9½	77,600
January 20	13-5	45,200
January 29	18-10	73,000
February 7	17-1	50,000
February 17	12-7	68,500
March 10	14-10	62,700
March 24	18-0	80,000
March 28	18-8	97,200
April 13	20-8½	122,600
April 21	21-5	110,000
April 28	21-9½	116,000
May 7	22-3½	125,900
May 18	24-0	147,000
June 2	24-7½	147,000
June 18	24-5	162,000
June 25	24-3	170,500

Breed's Pond.

No continued observations have been made of the leakage from Breed's pond. One measurement of the stream below the dam made when the water in the pond was at 20 feet 6 inches on the gauge, or very near the high water mark, showed a flow of about 120,000 gallons per day.

Conclusions.

The results of the observations of the leakage from the various reservoirs show that when the reservoirs are all full there is lost from the system at least 1,200,000 gallons per day, or one fifth as much water as is required for the supply of the entire city. When the water in the reservoirs is drawn down the leakage decreases rapidly, so that the average quantity lost is much less than this.

So far as it is possible to determine from the observations the leaks are in no case such as to affect the safety of the dams and the most serious feature in regard to the leaks is the loss from the reservoirs of a great quantity of water which has been obtained at a large expense.

Respectfully submitted,

WILLIAM S. JOHNSON.

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

CITY OF LYNN, MASSACHUSETTS

For the Fiscal Year Ending December 18, 1909

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 18, 1909

Compliments of

The Public Water Board

LYNN, MASS.
FRANK S. WHITTEN, PRINTER
1910

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 18, 1909

LYNN, MASS.
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OFFICERS FOR 1909.

	Term expires.
EDWARD E. PINKHAM	First Monday in April, 1914
THOMAS CAMPBELL, 2nd *Pres.*	First Monday in April, 1913
JOHN J. HEYS	First Monday in April, 1912
EDWARD V. FRENCH	First Monday in April, 1911
HARRY A. SWETT	First Monday in April, 1910

D. A. SUTHERLAND, *Clerk of Board and Superintendent.*
WALLACE O. MUDGE, *Water Registrar.*
CHARLES A. COWLES, *Pumping Engineer.*
GEORGE H. VENN, *Assistant Engineer.*
REYNOLD H. SUTHERLAND, *Chief Draughtsman.*
JAMES F. POOL, *Chief Inspector.*
HORACE G. LITTLEFIELD, *Foreman of Mains.*
HENRY T. WHEELOCK, *Foreman of New Services*
LOUIS L. CUNNINGHAM, *Foreman of Service and Main Repairs.*
WARREN H. MCCLAIN, *Foreman of Meters.*
JOHN H. NEWHALL, *Foreman of Water Shed.*
REUBEN J. MANSIR, *Foreman of Stable.*
JOSEPH N. DRISCOLL, *Storekeeper.*

Clerks.

R. GUY NORTHEY.
MARY MARKS.
HELENE C. PINKHAM.
L. MYRTLE HILLER.

Inspectors.

WILLIAM B. MOULTON.
JOHN CHAMBERLAIN.
JAMES E. DRISCOLL.
FREDERICK E. SPRAGUE.
HARRY L. NILES.

ANNUAL REPORT.

To the Honorable, The Mayor and City Council:

GENTLEMEN, — The Public Water Board submit the thirty-eighth annual report of the department in accordance with the requirements of the City Charter and the ordinances.

The membership of the Board has not changed during the year, Mr. Edward E. Pinkham whose term expired in March having been re-elected for a term of five years.

In the department Miss Mabel R. Butler resigned after a service of over five years on account of ill health. There were no other important changes in the department during the year.

Financial.

The gross income for the year was $282,000 or over $7,000 more than for the year 1908. As in recent years a large expenditure was made in relaying old cement pipes and renewing connecting services as far as necessary. The outlay this year being $52,000, thus continuing the policy of getting out the weak pipe as rapidly as the finances of the department would permit. In the other main divisions of expenditures the outlay has been generally less than in 1908 as an unusual number of necessary repairs and improvements were made last year. The only large and unusual work of repair during the year occurred at the main discharge pipe at Walden Pond dam which developed a serious leak necessitating very expensive work to reach and repair the break.

The receipts and expenditures for the year were as follows:

RECEIPTS.

Meter rates for the year	$150,648 00	
Fixture rates for the year	116,697 00	
Miscellaneous	14,738 00	
Total receipts		$282,102 00

EXPENDITURES.

Mains — Replacing old and weak cement pipes by cast-iron	$38,720 45	
Extensions and ordinary repairs	12,996 82	
Services — Relaid due to replacing the old cement pipe	19,304 42	
Ordinary repairs and new services	9,652 31	
Meters — New meters and repairs	7,904 00	
Salaries and office expenses	13,820 00	
Pumping Stations — Coal, supplies, repairs etc.,	10,159 00	
Stable and Shop — Expenses, carriages, wagons, etc.,	8,415 00	
Ponds, etc. — Patrolling water sheds, wood cutting, gypsy moths, care of brooks, canals, etc., and taxes	7,782 00	
Damages — Water due to pipe leaks, etc.	2,072 00	
[illegible] — [illegible]	6,817 00	
[illegible] improving [illegible] and plans [illegible]	4,888 00	
[illegible] for [illegible]	2,463 00	
		$153,994 00
[illegible]		67,515 00
[illegible]		54,756 00
[illegible]		$276,265 00
[illegible]		5,837 00
		$282,102 00

The efforts to collect water rents promptly have been continued during the year with very satisfactory results. All users are coming to understand that the ordinance require payments within a specified time and direct the shutting off of water by the Board if such payments are not made. The amounts due January 1st and unpaid were as follows:

Fixture rates, account 1909	$1,502 00	
Meter rates, account 1909	1,175 00	
Construction, account 1909.	1,219 00	
Amount still due from accounts previous to 1909,	16,173 00	
Miscellaneous	527 00	
		$20,596 00

Sinking Funds.

All of the sinking funds of the City have been specially considered during the year, including the water loans. As stated in the report of last year most of the funds of the Water Department have not in the past received as large payments as necessary to conform to the present sinking fund practice, that each fund should annually be given equal payments, the amount of which should be such that at maturity, the total would fully pay the debt. The Sinking Fund Commissioners propose that this shall be the practice with all funds in the future. Further that the several water funds shall be taken as they now stand and such equal annual payments be made during the remainder of the life of each, as to pay the loans in full at maturity. The funds would therefore be handled separately, each one taking care of itself. The Sinking Fund Commissioners have computed the requirements of the funds on this basis, and the table following shows the results, (subject to such slight variations as may be caused by the increase or decrease in the income from the funds) until the last of the present loans is paid in 1932. We have added to the table, the interest charges thus showing the total fixed charges which the department must meet, due to existing loans, for the next twenty-two years.

Sinking Fund and Interest Requirements — 1919-1932

Year of Act	Payments Required for Three Years Inclusive							Total Amount of Loan
	1910 to 1918	1910 to 1919	1910 to 1920	1910 to 1922	1910 to 1929	1910 to 1931	1910 to 1932	
1883	$7,025	. . .	. . .	. . .	. . .	. . .	. . .	$223,500
1888	13,612	$13,612	. . .	. . .	. . .	. . .	. . .	300,000
1890	5,454	5,454	$5,454	. . .	. . .	. . .	. . .	150,000
1891	4,863	4,863	4,863	$4,863	. . .	. . .	. . .	150,000
1892	4,308	4,308	4,308	4,308	$4,308	. . .	. . .	150,000
1893	12,828	12,828	12,828	12,828	12,828	$12,828	. . .	450,000
1901	6,666	6,666	6,666	6,666	6,666	6,666	$6,666	325,000
Sk. Fd. Totals	$54,756	$47,731	$34,119	$28,665	$23,802	$19,494	$6,666	. . . . .

Total Payments Required for Interest and Sinking Fund Charges on Present Outstanding Bonds

Year	Interest charges	Sinking Fund	Total
1910	$63,665	$54,756	$118,421
1911	63,315	54,756	118,071
1912	63,140	54,756	117,896
1913	63,140	54,756	117,896
1914	60,177	54,756	114,933
1915	58,377	54,756	113,133
1916	57,690	54,756	112,446
1917	56,290	54,756	111,046
1918	54,675	54,756	109,431
1919	48,675	47,731	96,406
1920	40,875	34,119	74,994
1921	34,475	28,665	63,140
1922	34,475	28,665	63,140
1923	29,675	23,802	53,477
1924	28,875	23,802	52,677
1925	28,875	23,802	52,677
1926	22,275	23,802	46,077
1927	20,275	23,802	44,077
1928	19,275	23,802	43,077
1929	17,875	23,802	41,677
1930	15,875	19,494	35,369
1931	14,875	19,494	34,369
1932	8,312	6,666	14,978

This method corrects the deficiencies of the past by greatly increasing the payments required during the next eight years. As stated in the report of 1908 much smaller contributions would take care of all the payments as they come due, if the funds were handled as a whole, and Table (B) of that report showed just how this would work out. This simply distributes the deficiencies of the past over a longer period and would tax the department much more lightly during the next ten years. If outlays, larger than the department funds could care for, were necessary during the next few years, it would appear proper to adopt this idea in part, and though not going to the limit of Table (B) of the 1908 report, establish a schedule of payments somewhere between Table (B) and the requirements of the table above.

On general principles it is always best and safe to pay up a back obligation as rapidly as possible and get it out of the way. It is pretty certain that the funds of the department will be sufficient to pay at the rates now proposed, including the interest charges, and still carry on the work as now and have sufficient margin to pay the additional interest and sinking fund requirements of such loans as may be made in the near future for works to purify the water and for such new pumping machinery as may be necessary. Within a few years, and as soon as the matter could probably be gotten at, the income would in all probabilities be sufficient to pay in addition the fixed charges on the cost of a reservoir or standpipe at greater elevation and the putting of the whole city on a higher pressure. It may, however, be necessary to use some of the income now going for the replacing of old cement pipes, for the payment of fixed charges, making a small loan to complete removal of the old pipe, and this would seem a proper thing to do if necessary.

It is a decided step in advance to have the sinking fund situation thus straightened out and the requirements for the future definitely fixed. Any future loans which may be made would be taken care of by equal annual payments. Such would simply have to be added to the present requirements to give the grand total. Thus the whole water debt is now in shape where it can be easily understood and cared for.

Improvements and Increase of Water Supply.

Taking up this matter where it was left by the report of last year, an appropriation of $5,000 was made by the City Council to be expended in the preparation of plans for a slow sand filter, thus permitting work to commence in accordance with the requirements of the Legislative Act. A contract drawn by the City Solicitor, was made December 31st, 1908, by the Board with Mr. William S. Johnson, Engineer, for the preparation of such plans, and the work upon them began at once.

Early in the year a petition was presented to the Legislature by the City Government asking that the Act that required the city to begin work on January 1st, 1909, be modified and further delay granted. In March hearings occurred at the State House before the Committee on Water Supply of the Legislature and our whole water problem was again very fully argued. In these hearings members or the Board took the position that further delay was unnecessary and that the best safety of our water supply required the construction of purification works. On May 28th the Legislature passed an Act granting an extension of time as follows:

[CHAP. 458.]

AN ACT RELATIVE TO THE WATER SUPPLY OF THE CITY OF LYNN.

Be it enacted, etc., as follows:

SECTION 1. The time within which the construction of the works for the enlargement and improvement of the water supply of the City of Lynn, required by the provisions of chapter four hundred and seventy-nine of the acts of the year nineteen hundred and seven, as amended by chapter six hundred and ten of the acts of the year nineteen hundred and eight, shall be begun by said city, is hereby further extended to the first day of January in the year nineteen hundred and ten, and the time within which said work shall be completed is hereby further extended to the first day of October in the year nineteen hundred and twelve

SECTION 2. Said city shall make such changes and modifications in the plans heretofore approved for enlarging and improving its water supply as shall be recommended by the Public Water Board, and approved by the City Council of the City and by the State Board of Health, and no money, except for preliminary investigation and for the preparation of plans, shall be appropriated or expended under the provisions of said chapters four hundred and seventy-nine and six hundred and ten or of this Act until detailed plans of the work for which such money is to be appropriated have been submitted to and have received the approval of the City Council. The city shall, however, through its Public Water Board, proceed, immediately upon the passage of this Act, to make preliminary investigations, surveys, plans and experiments necessary to secure the data upon which shall be predicated the detailed plans to be submitted to the City Council for its approval under the provisions of this Act.

SECTION 3. Said chapter four hundred and seventy-nine is hereby amended by striking out section two and inserting in place thereof the following: — *Section 2.* The City Council of said city shall at the time of authorizing said loan provide for the payment thereof in such annual proportionate payments as will extinguish the same within the time prescribed by this Act, and shall each year thereafter in the annual appropriation bills of the city make provision for payment out of the receipts for the use of water of such amounts of principal and interest on said loan as shall become due in the years for which the said appropriation bills are passed. If the receipts from the water rates available for the said purposes are not in any year sufficient for said payments the balance shall be raised by taxation.

SECTION 4 Except as said chapters four hundred and seventy-nine and six hundred and ten are specifically modified and amended hereby, the City of Lynn shall proceed in all respects in accordance with the provisions thereof.

SECTION 5. This Act shall take effect upon its passage. [*Approved May 28, 1909.*]

When it seemed probable that the Legislature would grant further time, work on the preparation of plans was stopped by the Board. Soon after the passage of this Act conferences began between the Mayor, Committee on Water Supply and the Water Board, and these were continued almost every week until the end of the year, practically each time a long evening being devoted to free and most profitable discussion.

During these joint meetings hearings were given to representatives of all of the plans for improving water supplies who desired to present their ideas to the city. In a number of instances more than one evening was devoted to the methods proposed. The following is a list of the systems presented and the names of the gentlemen who specially spoke for the plan.

Oliver Roche System: Allen Lowe, C. F. Fairbanks, Jr., W. M. Deitzman, E. B. Fraser and Mr. Willingberg, also John

C, Sparkes, consulting and analytical chemist for the city of New York. Jewel Filtration Co., Robert E. Millegan and Starr Parsons. American Water Purification Co., John N. McClintock. Ozone Process, James Howard Bridge. Fred T. Ley & Co., M. W. Denman, D. J. Abeel and Fred T. Ley, engineers and contractors.

In September the Mayor and nearly all the members of the Committee on Water Supply and the Board, together with the City Solicitor and the City Engineer, with the City Messenger as the efficient conductor, visited a number of plants for the purification of water, the following being the places and systems inspected: South Norwalk, Conn., slow sand filters; Little Falls, N. J., Chemical-Mechanical filters: Jerome Park, New York, Oliver Roche system; Philadelphia, Pa., double slow sand filters, and Springfield, Mass., slow sand filters.

Later in the year a visit was made by one of the Board to the Ozone Plant at Lindsey, Ont., and to a similar plant which had just been installed at Ann Arbor, Mich. Also to the Oliver Roche experimental unit at Niagara Falls, N. Y., and the conditions found were described to all at one of the joint meetings.

The possibility of taking water from the Metropolitan System was again considered and definite figures asked from the Metropolitan Board as to the cost to Lynn for entering the district and taking water. After careful consideration the Metropolitan Board replied as per the following letter:

METROPOLITAN WATER AND SEWERAGE BOARD

Boston, December 7, 1909.

Public Water Board of the City of Lynn

Gentlemen: Your letter of October 21, 1909, relative to the terms and conditions under which water might be furnished the city of Lynn from the Metropolitan Water Works was received and the questions have received investigation by our engineering department.

Water could be furnished the city of Lynn under the provisions of the Metropolitan Water Act, which provides that the Board shall, on application, admit any other city or town, any part of which is within ten miles of the State House to the Metropolitan Water District and furnish water, in the same manner as it furnishes water to the cities and towns included within the District, on the payment of such money as the Board shall determine.

Inasmuch as nearly all of the town of Saugus receives its supply from the Lynn Water Works, if that city should be admitted into the District there is little doubt but that Saugus also would find it necessary to apply for admission. It would, of course, be of benefit to both municipalities, if they are admitted into the District if they should be admitted at the same time. Consequently, in considering the questions arising it has been assumed that both municipalities would apply for admission, in case admission were desired by either.

The Board in its investigations has assumed that for the purpose of supplying Lynn and Saugus it would be necessary to lay a new main from the Fells Reservoir through Saugus into Lynn, or rather from a point near this reservoir in Ravine Road in Stoneham. It is assumed that water would be delivered into the present main pipes of the city of Lynn and that the supply for emergency use would be stored in the existing reservoir, which has an elevation of 187 feet. If the city should in the future deem it desirable, as has sometimes been suggested, to construct a new reservoir at an elevation not exceeding 230 feet, then the supply could be delivered into such new reservoir

Water delivered into the main pipes of the city would have a pressure equivalent to that of the elevation of the reservoir in the Middlesex Fells, or 271 feet above Boston City Base, less the loss in pressure due to the friction in the pipes which convey the water. This loss under present conditions would ordinarily be about ten feet during the hours of greatest use, and might rise to twenty-five feet under extreme conditions.

As the loss of head increases at a much more rapid rate than the consumption, at some time in the future it will undoubtedly be necessary to construct a new reservoir, as suggested, at a higher elevation than the existing one in order to maintain the pressure during hours of greatest use and it is assumed that whenever this reservoir shall be necessary it will be built and maintained by the City of Lynn at an elevation not above 230.

We have assumed that, in order to supply a small district of the city, it may be necessary to pump a small portion of the water furnished to the existing standpipe at elevation 260, the expense of which would be borne by the Metropolitan District

In determining the terms upon which cities and towns have been admitted since its establishment into the Metropolitan Water District, the Board has taken into consideration both the cost of works which would be necessary in order to supply the new municipality and also what the municipality would have been obliged to pay in case it had been a part of the district without receiving water, or, in another aspect, what interest it acquires in the works and sinking funds already belonging to the Metropolitan District

The cost of the works which would be directly demanded by the extension to Saugus and Lynn is very large, but the entire cost would by no means be placed upon these two municipalities.

It has been determined by the Board that the City of Lynn should, in case it should be admitted under the circumstances and [illegible], be called upon to pay the sum of $[illegible] and that the town of Saugus should pay in addition the sum of $[illegible].

Under the present law the city or town which furnishes a part of its water supply from its own works is allowed in its apportionment the sum of $[illegible] for each million gallons of water furnished. It is possible, however, that, in case the city of Lynn should enter into an arrangement by which it should permanently supply a certain quantity of water [illegible] during the year, some change might be effected through the Legislature by which a larger sum per million gallons would be allowed.

Of course, after admission, subject to the terms established, water is furnished to all of the cities and towns in the District, and yearly assessments are levied in accordance with the law proportional to valuation and actual consumption. It is estimated that the annual assessment for the city of Lynn would now be approximately $[illegible], and that of the town of Saugus would be $[illegible].

Yours respectfully,

(Signed) **HENRY H. SPRAGUE,**

Chairman.

[illegible] was found at the end of the [illegible] Legislature required work to [illegible] been reached and the [illegible] agreement by the Board [illegible]

[illegible] Mass., December 27, [illegible]

[illegible] the City of Lynn [illegible] its water supply by January [illegible] by the Water Board and [illegible] State Board of Health before any [illegible]

[illegible] the Mayor and Committee [illegible] every week and devoted a [illegible] At the beginning of this [illegible] material improvement must [illegible] because the Legislature required this, but from the fact that those who have most studied the situation agreed that under present conditions the water supply of the city is not sufficiently safeguarded

During these months the door has been kept wide open for all who had any plan for improving our water, and all who came have been heard in full. The Mayor, Committee on Water Supply and Water Board have visited several plants for filtering water including the Oliver-Roche system at New York, Double Sand Filtration at Philadelphia, Mechanical Filters at Little Falls, N. J., and Slow Sand at South Norwalk, Conn., and Springfield, Mass. Plans for purification by Ozone were also considered.

The only applicable plans not regarded as experiments are mechanical and slow sand filtration. The others are purely experimental (except double filtration which is not adapted to Lynn conditions) and are without results from actual use in any large community. We feel it would be imprudent to adopt any system which has not survived the test of time for a reasonable period.

After all this investigation therefore the result is that no methods for improving our supply, except the following, can be recommended:

1. Take our supply in whole, or in part, from the Metropolitan System.
2. Filter all our water by the so-called mechanical or chemical filters.
3. Purification by long storage by increasing the capacity of our ponds.
4. Filter our water by slow sand filters.

The Metropolitan supply would give permanently safe and acceptable water, the cost, however, from recent figures would be excessive both for entering the Metropolitan District and for the yearly assessment, probably necessitating an increase in water rates. In view of the large outlays already made at Walden Pond and above, it would not be expedient for the city to take Metropolitan water at present.

Mechanical filters have been tried and found satisfactory in many places; they would unquestionably give a safe and acceptable water for Lynn and the cost would be reasonable. There is, however, a somewhat widespread objection to the use of water to which chemicals have been added, and this would undoubtedly be found quite strong in Lynn. It can not therefore be wisely recommended.

Purification by long storage *or* by slow sand filtration therefore remain, after the fullest investigation of all known methods as the only plans which can be advised for the city. The data so far obtainable seems to show that any satisfactory plan for long storage would be expensive. Some further information on this point is still desired and is being collected as rapidly as possible.

A definite recommendation can therefore not now be made and a short [illegible] of time is desired. It is expected that a final report and recommendation will soon be made. This is therefore a report of progress [illegible] the Legislative Act [illegible] the definite recommendations as to the [illegible].

Respectfully submitted,
(Signed)

THOMAS CAMPBELL, Chm.
E. E. PINKHAM,
HARRY A. SWETT,
E. T. FRENCH,
GEO. J. [illegible]

Public Water Board.

After making this report the joint conferences were continued with the expectation of soon reaching an agreement. All of this work was entirely additional to the necessary duties of the Board and Committee on Water Supply in connection with the ordinary operation of the Water Department and entailed a very large amount of extra work.

Experimental Filter.

[illegible] the experimental filter in the City Hall yard was run a [illegible] end of the year and water distributed for a [illegible] of the joint committee so that all [illegible] experience with filtered water.

Organization.

The new organization of the department put into effect last year got well into operation during the year and gave generally excellent results. Details were perfected and all carried along with the aim of getting the best efficiency in every direction.

Meters and Water Rates.

The plan of reading meters monthly has been continued and has worked well. It results in saving waste of water and prevents the running up of excessive and burdensome bills. The policy of extending the use of meters has as rapidly as possible been continued, and is believed the true method of determining the amount of water used.

The whole question of water rates and the method of charging for the first cost of meters needs consideration and probably readjustment. With the very large amount of unusual work which the year has required it has been impossible to take up this matter.

Water Supplies for Year.

About 2,333,000,000 gallons of water were used during the year, or about 95,000,000 gallons more than for the year 1908. Of this amount about 1,633,000,000 gallons came from the water sheds of the four ponds and about 1,100,000,000 gallons from the Saugus River.

The Saugus River was let into Hawkes Pond on February 8th. This was later than last year because of the very dry fall and so small a flow in the river that it was not considered safe to begin pumping until an ample supply was assured by the rains of the late winter. Pumping into Walden was stopped on April 21st, a few days sooner than intended on account of the development of a serious leak in the pipe under the dam. The pond, however, was so nearly full that an ample supply was fortunately assured.

Water from Walden Pond was held in storage until July 14th when it was let down into Birch Pond and thence to the city, thus eighty-four days of absolute storage were obtained. In 1908 the time of storage was one hundred and five days, the lesser time this year being due to the fact that the ponds had been drawn very low in 1908 on account of the very dry year, so that it took longer to fill them, and consequently there was less time for storage.

The amount of water in storage in the four ponds on the first of each month of the year was as follows:—

	Million gallons.
January 1, 1909	1,045
February 1, 1909	1,023
March 1, 1909	1,630

	Million Gallons
April 1, [illegible]	2,135
May 1, [illegible]	2,384
June 1, [illegible]	2,329
July 1, [illegible]	2,240
August 1, [illegible]	2,018
September 1, [illegible]	1,771
October 1, [illegible]	1,593
November 1, [illegible]	1,431
December 1, [illegible]	1,382
December 31, [illegible]	1,376

The rainfall for the year as recorded at the Walnut Street Pumping Station was 36.13 or about 6.87 inches less than the average of about 43 inches. Ample water was on hand at all times and the year closed with 1,376,000,000 gallons in the ponds which was considerable more than for the previous year.

Again we were fortunate in general freedom during the year from organic growths in the ponds so that there was little trouble from any specially disagreeable tastes and odors in the water.

The Water Sheds.

Constant inspection of the watersheds of the four ponds was continued during the year. The men on this work strive constantly to discover any new source of pollution due to the building of houses on the watersheds or to changes in the disposal of sewage and other refuse from safe methods previously adopted. During the warm months special care is needed to prevent bathing in the ponds, and at all times constant watch is kept to see that those who travel over the watershed do not in any way bring pollution into the water. The men on this work also keep the shores of the ponds clean and the waterways open and free from refuse. This work is believed most valuable and necessary for safeguarding, so far as possible, the waters of the *pond*, which is the water most quickly reaching the consumer from the supplies. The conditions on the Saugus River are such that no supervision of this kind is feasible, and reliance is placed on the storage in Walden Pond before use, to give sufficient time to insure the destruction of disease germs coming from the Saugus River.

A weir was constructed August 25th, on the Saugus River at Montrose which is below the point where our canal takes water and records were obtained of the flow of the river. It is believed that these may be very valuable in the future. The average daily flow for each month since the weir was put in is as follows:

	Gallons
September	360,000
October	1,380,000
November	430,000
December	2,060,000

Dams. Leakage and Repairs.

The weirs which measure the leakage from the four dams were kept in service during the year as far as possible and the results are given in tables accompanying the report of the Superintendent.

These showed no considerable change in leakage from last year but the records are of value in giving constant information as to conditions and prompt indication of any change.

The main pipe under the dam at Walden Pond through which water is pumped into the pond and later through which it is drawn from the pond, developed a serious leak as already stated at about the end of the pumping period. The flow of water was sufficient to begin to wash the earth embankment so that pumping as already stated was stopped. It was not feasible to dig up this pipe until the water in Walden Pond had been very considerably lowered and this did not occur until late in the fall. Work was then commenced and the leak was found so far in the bank that a deep cut was made on the outer slope of the dam and carried into the core wall. The cut required very careful shoreing and the City Engineer was requested to take full charge of the engineering features as it was recognized that great care was needed when making so deep a cut into an earth dam of this height.

The work was done by the employees of the Board who worked continuously seven days in the week. On reaching the pipe it was found that settlement had occurred opening joint and further that several lengths of pipe had evidently corroded at joints thus causing leaks. The pipe had originally been laid in the ordinary manner for bell and spigot joints and unfortunately the bells were short and the pipe had not been incased in concrete as is the usual custom when putting a pipe through such earth embankments.

The pipe was removed and new pipe put in with the joints most carefully made and then all was encased in a solid mass of concrete with board foundations, and re-enforcing rods.

There is a second pipe through the dam which has been used simply as a waste pipe and this was connected to the main running to the Walden Pond Pumping Station with proper valves so that either of the pipes under the dam may now be used, thus giving all possible safeguards in case of any break.

Consumption.

The per capita consumption of water for the year was 69.5 gallons or about 2.2 gallons less than for the year 1908. This indicates a generally satisfactory condition.

Pumping Engines and Stations.

No considerable work has been necessary on any of the pumping engines or pumping stations during the year. The small station at the head of Birch Pond was not used and it is probable that it will not be necessary to use this again. It is not in good repair and it has not seemed desirable to spend anything on it.

At Walnut street the chimney, has been provided with lightning rods the best modern practice having been adopted and three rods put on with connecting bands at proper intervals. The rods were then thoroughly grounded through pipe connections of good size firmly bolted to three lengths of sixteen inch water main buried in the street. It is believed that this reduces the danger or damage to the chimney by lightning to a very small chance and gives considerable added safety to our pumping plant.

Additional pumping machinery will be necessary in the near future as previously stated. This is a vital matter which must soon receive attention to secure reasonable provision against interruption of service to the city.

Street Pipes.

A good deal of old and weak cement pipe was removed during the year. The connecting services were as far as necessary also replaced and following the policy previously established new hydrants were added as far as seemed necessary. The following table shows the work done in this direction since 1903:

Year.	Main Pipe Laid. Miles.	Main Pipe Laid. feet.	Service Pipe Laid feet.	New Hydrants.	Hydrants Renewed.
1903	1	4,051	7,900	1	3
1904	4	1,116	9,957	—	—
1905	3	3,218	24,648	22	—
1906	2	4,897	24,419	15	—
1907	4	326	27,689	30	19
1908	7	1,362	36,459	72	17
1909	4	4,705	37,229	28	25

The amount done was less than in 1908 as the much larger requirements for sinking funds left no more money which could properly be expended for this work.

There remains at the end of the year about thirteen miles of cement pipe, a considerable part of which is to the best of our knowledge in fairly good condition so that it may be expected to give reasonably satisfactory service until it can be replaced. It is believed the best policy to replace this old pipe as rapidly as funds will permit, taking first that pipe which is considered less reliable or which is laid in streets that are to be thoroughly resurfaced.

Repairs, Shop and Office.

The shops of the department located in the City Hall yard still remain and are becoming more and more inadequate for the work the department must do, so that the work cannot be done efficiently or economically. It is very desirable that better facilities be provided as soon as possible. The many other matters on hand during the year prevented making any special progress in this direction.

The office facilities in the City Hall are also inadequate. The space used by our draughting department was desired for other uses and the department moved to the top floor. This separates the draughting from the shop-men, prevents the close connection of departments necessary for efficiency and is in every way an undesirable and expensive arrangement.

Better telephone service such as could be obtained by a City Hall exchange is still most desirable as previously suggested.

Coal.

The coal used during the year was bought under a guarantee of efficiency. Standard records of actual results at the pumping stations were kept and the final result was that the contractor slightly exceeded the requirements and was paid in accordance with the contract a small bonus.

High Pressure Water.

An investigation was made early in the year as to the possibility of a higher water pressure for the city. Several plans were worked out in a preliminary way and estimates made. It was found that it would be entirely feasible to increase the pressure to about one hundred pounds throughout the business and high value section of the city. With higher pressure the fire protection throughout the city and especially in the business section would be greatly improved. A large number of powerful fire streams could be quickly concentrated at any danger point and the chance of severe conflagration greatly reduced. Steam fire engines could be largely held in reserve and after consultation with the Chief of the Fire Department it was believed that it would be possible to make such saving in fire department costs as to more than pay the interest and sinking fund charges and the necessary expenditure for such a high pressure system.

The full report on this subject made by the Board to the Government is attached (page 66), and it is believed that it would be in every way desirable to take up this matter as soon as the press of other work will permit, and perfect plans for such a high pressure system, putting them into force as rapidly as possible.

In General.

The Board acknowledges with pleasure the courtesy and help generally given to its members and to all employees of the department in their performance of the various duties required of them, all of which has been helpful in the earnest endeavor to carry on a large amount of work in many directions.

Respectfully submitted,

THOMAS CAMPBELL, 2nd,
EDWARD E. PINKHAM,
HARRY A. SWETT,
E. V. FRENCH,
JOHN J. HEYS,

Public Water Board.

Treasurer's Statement.

Amount of debt December 31, 1908	$1,768,5[illegible]	
Bonds matured and paid 1909	[illegible] 00	
		$1,658,5[illegible]

SINKING FUNDS

Amount of funds December 31, 1908	$513,[illegible]36 78	
Received from City Treasurer 1909	25,657 3[illegible]	
Earnings of Sinking Funds 1909	[illegible],528 18	
	$55[illegible],222 26	
Deduct bonds paid 1909	[illegible]	
	$44[illegible],222 26	
Amount in hands of City Treasurer	54,756 [illegible]	
		$[illegible]3[illegible],[illegible]78 26
[illegible]		$[illegible],[illegible] 74

Water Maintenance.

[illegible]

[illegible]	$[illegible]	
[illegible]	[illegible]3 [illegible]	
		$[illegible] 57

EXPENDITURES.

F[illegible]	$153,9[illegible] 42	
F[illegible]	67,5[illegible] 0[illegible]	
		[illegible] 42
		$6[illegible] 15

[illegible]

ROBERT E. RAMSDELL,

City Treasurer.

REPORT OF WATER REGISTRAR.

To Thomas Campbell, 2d, President:

I herewith present the financial condition of the department for the year ending December 18, 1909.

RECEIPTS.

Meter rates, account 1909	$122,183 28	
Meter rates, account 1908	27,951 93	
Meter rates, account 1907	259 60	
Meter rates, account 1906	253 04	
		$150,647 85
Fixture rates, account 1909	$109,209 86	
Fixture rates, account 1908	3,699 15	
Fixture rates, account 1907	210 40	
Fixture rates, account 1906	1,324 67	
		114,444 08
Miscellaneous, sundry sales		11,227 78
Additional, or fractional rates		2,252 98
Fines		289 80
Extra pipe, account 1909	$2,403 62	
Extra pipe, account 1908	471 91	
Extra pipe, account 1907	215 72	
Extra pipe, account 1906	55 25	
		3,146 50
Total receipts as per cash book		$282,008 99
Credits from other departments		93 58
Total receipts		$282,102 57

EXPENSES.

Maintenance	$147,177 62	
Interest	67,515 00	
Transfer to Sinking Funds	54,756 00	
Rebate to Saugus	6,816 80	
Balance to account 1910	5,837 15	
Total		$282,102 57

CONSTRUCTION.

J. A. Hurd, land, (Lynnfield)	$300 85

MAINTENANCE.

	Pay Rolls.	Bills.	Total.
Mains and repairs	$21,460 95	$30,166 32	$51,627 27
Services repaired	15,935 62	13,021 01	28,956 63
Walnut street pumping station .	6,653 89	10,078 68	16,732 57
Salaries and office expenses . .	11,220 34	2,600 03	13,820 37
Stable and shop	3,683 06	4,732 18	8,415 24
Meters and repairs	3,474 72	4,518 81	7,993 53
Patrolling water sheds . . .	4,933 46	499 65	5,433 11
Walden Pond Dam repairs . .	1,412 53	708 82	2,121 35
Walden Pond pumping expenses .	1,448 93	977 76	2,426 69
Canal	1,465 18	48 15	1,513 33
MISCELLANEOUS:			
Ipswich Mills, *final*		2,000 00	2,000 00
William S. Johnson		2,779 39	2,779 39
Filtration expenses		963 74	963 74
Taxes, Saugus		835 10	835 10
E. F. Dwelley		745 30	745 30
Structural Stone Co.		341 60	341 60
E. F. Pride, *expert* . .		200 00	200 00
State Board of Health . .		200 00	200 00
Damages		72 40	72 40
	$71,688 68	$75,488 94	$147,177 62
Rebate to Saugus, 50% of receipts .			6,816 50
Total			$153,994 12

COMPARATIVE STATEMENT

Receipts for 1909	$282,102 57
Receipts for 1908	274,877 88
Increase	$7,224 69

Amount outstanding as per balance sheet:

Fixture rates, account 1909	$1,502 15
Fixture rates, account 1908	284 36
Fixture rates, account 1907 .	256 08
Fixture rates, account 1906	7,725 28
Amount carried forward,	$9,767 87

Amount brought forward.	$9,767 87	
Meter rates, account 1909	1,175 17	
Meter rates, account 1908	1,604 61	
Meter rates, account 1907	1,004 90	
Meter rates, account 1906	2,200 20	
Miscellaneous	526 76	
Construction, account 1909	1,218 62	
Construction, account 1908	68 83	
Construction, account 1907	132 01	
Construction, account 1906	2,806 87	
		$20,595 93

The accounts for 1906 includes the year 1906 and prior years. By order of the City Council all these bills were turned over to the City Treasurer for collection.

Total amount of 1906 outstanding, $12,732.44.

CONSTRUCTION.

J. A. Hurd, land	$300 00

Following will be found the usual tables

WALLACE O. MUDGE,
Water Registrar.

STATEMENT.

SHOWING COST OF WORKS TO DECEMBER 19, 1908.

Mains, hydrants and gates	$883,595 30
Walden and Glen Lewis ponds	564,658 42
New supply and land	340,182 87
Services and courts	337,885 20
Engines and boilers	140,327 29
Hawkes pond	161,036 53
Reservoirs and land	131,581 49
Birch pond and land	93,471 84
Engine house, pump and conduit, Walden pond	83,003 72
Pipe conduits and land	81,289 39
Engine house and land	57,562 39
Breed's pond and land	57,135 28
Hawkes pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED
ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC.,
CONTAINED IN THE SAME, TOGETHER WITH THE
NUMBER OF FIRE HYDRANTS DEC. 31, [illegible]

	LYNN.	SAUGUS.	TOTAL.
Dwellings . . .	13.418	1.313	14.731
Stores and shops	1.350	52	1.402
Factories . . .	245	4	249
Offices . .	590	17	607
Restaurants and saloons	85	..	85
School-houses . . .	62	12	74
Churches . . .	34	5	39
Bakeries . . .	30	..	30
Laundries	20	..	20
Engine-houses .	12	3	15
Families	19.050	1.350	20.400
Boarding-houses .	260	5	265
Faucets . . .	35.925	2.300	38.225
Water-closets . . .	17.025	713	17.738
Bath tubs . . .	6.007	420	6,427
Hose bibs	3.400	215	3,615
Urinals	190	8	198
Heaters	450	90	540
Stationary engines	170	5	175
Motors	25	..	25
Green-houses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes . . .	23	1	24
Stand-pipes for water-carts . . .	82	..	82
Sewer connections	30	..	30
Automatic sprinklers	130	5	135
Hydrants	955	190	1,145
Hydrants for car sprinklers . .	44	1	45

STATEMENT.

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 15
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,807 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,573 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 77
From January 1, 1889, to January 1, 1890	141,865 53
From January 1, 1890, to January 1, 1891	154,788 27
From January 1, 1891, to January 1, 1892	171,744 85
From January 1, 1892, to January 1, 1893	188,979 88
From January 1, 1893, to January 1, 1894	177,803 56
From January 1, 1894, to January 1, 1895	176,655 50
From January 1, 1895, to January 1, 1896	185,572 88
From January 1, 1896, to January 1, 1897	190,531 33
From January 1, 1897, to January 1, 1898	183,711 97
From January 1, 1898, to January 1, 1899	186,658 35
From January 1, 1899, to January 1, 1900	193,699 01
From January 1, 1900, to January 1, 1901	199,003 54
From January 1, 1901, to January 1, 1902	203,078 45
From January 1, 1902, to January 1, 1903	215,692 03
From January 1, 1903, to January 1, 1904	224,440 44
From January 1, 1904, to January 1, 1905	233,706 83
From January 1, 1905, to January 1, 1906	240,475 73
From January 1, 1906, to January 1, 1907	259,255 50
From January 1, 1907, to December 19, 1907	290,111 18
From December 19, 1907 to December 19, 1908	274,877 88
From December 19, 1908 to December 19, 1909	282,102 57
	$5,785,065 09

FUNDED WATER LOAN.

When Payable.		Rate Per Cent.	Amount
April	1, 1910	3½	10,000
April	1, 1911	3½	10,000
November	1, 1913	4	20,000
November	1, 1914	3¾	31,000
March	15, 1915	4	50,000
December	1, 1914	4	20,000
December	1, 1915	3¾	6,000
April	1, 1916	3¼	2,000
May	1, 1916	3½	24,500
September	1, 1916	4	10,000
October	1, 1916	4	9,000
February	1, 1917	3½	6,500
June	1, 1917	3½	3,500
July	1, 1917	4	7,500
August	1, 1917	4	5,000
October	1, 1917	4	2,000
November	1, 1917	4	6,500
April	1, 1918	4	15,000
June	1, 1918	4	10,000
July	1, 1918	4	50,000
April	1, 1919	4	100,000
July	1, 1919	4	110,000
January	1, 1920	4	35,000
April	1, 1920	4	150,000
April	1, 1921	4	50,000
October	1, 1921	4	25,000
January	1, 1922	4	50,000
July	1, 1922	4	25,000
April	1, 1923	4	40,000
July	1, 1925	4	165,000
July	1, 1926	4	50,000
September	1, 1927	4	25,000
July	1, 1928	4	25,000
October	1, 1928	4	10,000
July	1, 1929	4	25,000
January	1, 1930	4	25,000
October	1, 1930	4	25,000
July	1, 1931	3½	25,000
January	1, 1932	3½	75,000
April	1, 1932	3½	325,000
			$1,658,500

REPORT OF SUPERINTENDENT.

To the Public Water Board:

GENTLEMEN, — I herewith present the 38th Annual Report of the Superintendent for the year ending 1909.

We have taken our supply of water during the past year from Breed's, Birch, Hawkes and Walden Ponds and Saugus River.

A detailed statement of the transactions of the Water Department will be given in tables, plans, diagrams, etc. to follow:

	Gallons.
Total pumped in 1909	2,332,657,250
Total pumped in 1908	2,237,331,153
Increase in pumpage in 1909	95,326,097
Total consumption in 1909	2,333,886,263
Total consumption in 1908	2,239,331,153
Increase in consumption	94,555,110

The average consumption of water per day in 1909 was 6,394,209 gallons, showing an increase of 275,845 gallons per day more than in 1908.

The rainfall at the City Hall in 1909 was 39.52 inches. The rainfall at the pumping station on Walnut street in 1909 was 36.13 inches.

On December 31, 1908, our supply of water in all ponds was 1,050,000,000 gallons. December 31, 1909 our supply was 1,376,000.000 gallons, 326,000,000 more than in 1908 which is due to increase in the rainfall of nine inches in 1909 over the previous year.

Draughting Department

This department has made plans and furnished blue prints to the foremen giving directions and stock to be used in laying the main pipe in the streets that have been laid this year. It has taken measurements of all the main pipe, branches, shut offs and hydrants that have been put in during the year, and drawings have been made showing the location of the pipe and fittings in the streets.

There have been 900 measurements and diagrams made showing the location of all new and relaid services, also a number of tables, diagrams and maps made for the use of the Board. Thirty-one hundred stock orders have been issued to the storekeeper for stock to be used on the work done by the different departments.

Main Pipe Department.

The department has removed about four miles of cement-lined pipe and relaid with cast-iron pipe generally of larger diameter to supply the increased demands.

There has been 2,476 feet of pipe laid in new streets and extensions. About twelve miles of cement-lined pipe remains in the ground. It is intended to relay about four and one-half miles of the oldest pipe in 1910; when this is done the remaining pipe will be in condition to stand the full pressure that can be given with our present system.

New Services.

The new service division has put in three hundred and eighteen services in Lynn and seventy-two services in Saugus, an increase of sixty-one over the previous year.

Services Repaired.

The repair division has renewed five hundred and twenty-two services and changed five hundred services from old main pipe to new main, a decrease of 269 from 1908.

New Meters.

The Meter Division has installed four hundred and twenty-nine new meters and replaced one hundred and ninety-two old meters with new ones, an increase of sixteen meters over previous year.

Stable.

There are three men on duty at the stable through the day and two at night. They attend to all calls for shutting off water in case of leaks, etc. A man goes to all fires when a second alarm is given to assist the firemen in case a hydrant is broken in opening or closing or a leak in the mains or fire pipes.

Store-keeper.

The storekeeper has charge of all stock, and tools, keeping a daily record of the amount on hand and reporting to the Superintendent when supplies are needed. He supplies the foremen with all necessary tools and material required for the work to be done.

D. A. SUTHERLAND,

Superintendent.

Microscopical Examintion of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1906.	January 15.	February 17.	March 17.	April 17	May 16.	June 18.	August 25.	September 15.	October 6.	November 21.	December 28.
Number of Sample	45814	45005	46157	46414	46700	4[illegible]538	47102	47606	47131	47823	48035
Plants.											
DIATOMACEÆ:											
Asterionella	924	0	220	203	103	0	35	[illegible]	71	1304	[illegible]
Cyclotella	141	1	12	10	5	0	1	23	2	54	31
Melosira	0	0	0	2	0	0	0	0	0	24	0
Synedra	15	1	38	104	111	0	7	1	0	12	16
Tabellaria	16	0	14	71	307	0	112	56	118	58	12
CYANOPHYCEÆ:											
Anabæna	0	0	0	0	0	0	2	0	1	1	0
ALGÆ:											
Arthrodesmus	1	0	0	8	4	1	0	1	0	0	0
Botryacoccus	0	0	0	0	0	0	24	0	0	0	0
Protococcus	0	0	0	0	0	0	18	0	8	0	0
Raphidium	1	1	1	12	0	0	0	18	1	0	0
Animals.											
INFUSORIA:											
Cryptomonas	1	0	0	0	0	0	0	6	0	10	12
Dinobryon	40	0	0	0	0	0	84	57	117	56	10
Mallononas	2	1	2	0	0	0	1	0	6	0	0
Synura	0	3	1	0	0	0	0	0	0	2	0
Trachelomonas	0	1	1	0	0	0	1	1	0	0	0
Chlansydomonas	0	42	4	0	0	0	0	0	0	[illegible]	188
Glenodinium	0	10	0	0	0	0	0	0	0	2	1
VERMES: Anurea	1	2	0	0	0	0	1	0	0	0	0
VERMES: Polyartha	0	0	0	0	1	0	0	0	0	0	0
CRUSTACEA: (Cyclops,	.08	0	.02	0	.04	.08	.02	.02	0	.02	0
FUNGI Crenothrix	0	0	0	0	0	0	2	2	0	0	[illegible]
FUNGI *Zoöglœa*	5	5	5	5	5	5	5	5	5	2	2
Total	1147	67	367	583	[illegible]	21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The following microscopic examinations were made by the State Board of Health.

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1909.	January 15.	February 17.	March 17.	April 27.	May 20.	June 28.	July 27.	August 25.	September 25.	October 4.	November 24.	December 28.
Number of Sample	45815	45996	46168	46415	46585	46801	46982	47162	47595	47435	47824	48036
Plants.												
DIATOMACEÆ:												
Asterionella	240	74	56	38	42	2	4	0	88	29	455	384
Cyclotella	111	3	1	25	24	0	2	17	14	0	20	25
Melosira	6	0	0	0	0	0	2	0	0	0	0	0
Synedra	18	5	32	91	5	16	3	1	0	0	2	12
Tabellaria	6	1	0	0	20	4	0	36	22	2	13	21
Pleurosigma	0	0	0	40	0	0	0	0	0	0	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	44	0	0	28	36	2	12	0
ALGÆ:												
Botryacoccus	0	0	0	0	0	0	0	93	2	4	2	0
Protococcus	0	0	0	28	0	0	47	4	0	0	0	0
Raphidium	0	2	2	4	4	0	0	0	22	2	0	18
Animals.												
INFUSORIA:												
Dinobryon	5	0	0	18	83	40	6	6	358	347	20	27
Peridium	1	2	2	0	0	0	0	0	0	0	0	0
Trachelomonas	0	1	0	0	0	1	0	5	0	7	0	0
Uroglena	0	0	0	0	0	0	0	0	0	0	7	22
Vorticella	0	2	0	0	1	0	0	0	0	0	0	0
VERMES: (Anurea)	0	0	1	0	1	0	0	0	0	0	0	0
Polyarthra	0	0	0	0	1	5	0	0	0	0	0	0
CRUSTACEA: (Cyclops)	.04	0	04	02	0	.06	.02	.14	.10	10	.04	0
FUNGI:												
Zoöglœa	5	5	3	5	5	3	[illegible]	8	3	5	1	3
Total	398	95	97	249	230	71	72	198	545	398	532	512

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1909.	January 15.	February 17.	March 17.	April 27.	May 20.	June 28.	July 27.	August 25.	September 25.	October 4.	November 24.	December 28.
Number of Sample	45817	45968	46171	46417	46587	46708	46984	47105	47508	47137	47820	48038
Plants.												
DIATOMACEÆ:												
Asterionella	575	11	21	802	1306	0	2	37	127	20	584	370
Cyclotella	77	19	9	7	72	12	33	20	4	2	22	30
Melosira	0	0	0	8	0	0	0	0	14	6	0	0
Navicula	0	2	1	1	0	0	0	0	0	0	0	0
Synedra	6	4	6	71	120	8	0	1	1	2	16	258
Tabellaria	3	2	13	17	26	24	87	223	65	60	208	18
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	16	0	0	4	5	2	0
ALGÆ:												
Arthrodesmus	4	0	0	2	0	1	0	1	2	4	6	0
Protococcus	0	0	0	6	0	0	0	9	0	0	0	0
Raphidium	2	5	5	5	0	0	5	0	2	11	0	4
Scenedesmus	0	0	0	0	8	0	8	0	4	0	0	0
Sphaerozosma	0	0	0	0	0	0	0	12	0	0	0	0
Animals.												
INFUSORIA:												
Cryptomonas	2	1	0	4	4	0	0	0	6	0	0	22
Dinobryon	9	0	4	0	0	0	0	380	9	0	4	0
Trachelomonas	0	0	0	0	4	1	1	4	3	2	0	0
Glenodinium	3	2	8	2	2	0	0	5	0	0	0	0
Chlamydomonas	0	0	0	10	134	0	0	0	0	15	151	42
VERMES: Polyarthra	0	1	0	0	0	0	0	0	0	0	0	0
VERMES: Anurea	0	0	0	0	0	0	0	[illegible]	[illegible]	0	0	0
CRUSTACEA: (Cyclops)	0	.02	0	0	0	[illegible]	[illegible]	.02	.04	.06	[illegible]	0
FUNGI: Crenothrix	0	3	1	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FUNGI: Zoöglœa	7	3	3	8	2	5	6	5	10	8	5	5
Total	688	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Microscopical Examination of Water from Quannapowitt Lake.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1909.	January 15.	February 17.	March 17.	April 27.	May 20.	June 28.	July 27.	August 25.	September 25.	October 4.	November 26.	December 28.
Number of Sample . .	45819	[illegible]	46160	46410	46589	46800	46986	47167	47600	47439	47828	[illegible]
Plants.												
DIATOMACEÆ:												
Asterionella	0	1	2	0	118	0	0	0	0	0	0	0
Cyclotella	0	0	0	4	2	20	0	0	0	2	0	1
Navicula	0	0	0	0	0	2	1	1	0	2	0	[illegible]
Synedra	0	23	552	708	302	1	0	2	1	0	1	1
CYANOPHYCEÆ:												
Anabaena	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0	0	0	3	0	[illegible]
Oscillaria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	0	0	0	3	0	[illegible]
ALGÆ:												
Protococcus	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	12	0	20	0	[illegible]
Raphidium			1	[illegible]	[illegible]	0	0	0	1	0	1	[illegible]
Scenedesmus			[illegible]	28	28	0	0	0	0	8	0	[illegible]
Animals.												
PROTOZOA:												
Cryptomonas	1	1		[illegible]		0	0	0	0	0	[illegible]	[illegible]
Dinobryon	[illegible]	2	1	72		0	0	0	0	0	[illegible]	[illegible]
Mallomonas		2	[illegible]	1		[illegible]	0	0	0	2	[illegible]	[illegible]
Peridinium		[illegible]		[illegible]		0	0	0	0	0	[illegible]	[illegible]
Synura	[illegible]	[illegible]	15		0	[illegible]	0	0	0	0	[illegible]	0
Trachelomonas	7	[illegible]	1	2	[illegible]	2	0	1	0	1	0	[illegible]
Uroglena		[illegible]	[illegible]	12	[illegible]	0	0	0	0	0	[illegible]	[illegible]
Glenodinium	[illegible]	15	[illegible]		1	[illegible]	0	0	0	0	0	[illegible]
VERMES: Polyarthra .	[illegible]	[illegible]	[illegible]			0	0	0	0	0	[illegible]	[illegible]
CRUSTACEA: Cyclops			2	[illegible]	[illegible]	[illegible]	.02	0	0	.02	[illegible]	
FUNGI:												
Crenothrix	[illegible]	[illegible]	[illegible]	[illegible]	11	1	81	4	97	0	1	[illegible]
Zoogloea		[illegible]	5	5	3	5	6	3	3	5	1	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	88	23	102	40	3	[illegible]

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1900.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	188,194,300	6,070,784	62,586	. . .	65.08	407.62
February	171,382,738	6,120,812	. . . .	514,032	66.53	410.08
March	179,348,400	5,785,433	209,003	. . .	62.88	388.46
April	172,089,412	5,736,313	79,020	. . .	62.35	385.16
May	185,595,880	5,986,964	215,622	. . .	65.07	401.07
June	200,416,956	6,680,565	. . . .	7,326	72.61	448.57
July	221,694,503	7,151,435	21,869	. . .	77.73	480.10
August	214,208,823	6,909,962	145,636	. . .	75.11	463.07
September	193,913,611	6,463,787	22,003	. . .	70.26	433.01
October	206,332,743	6,655,895	76,348	. . .	72.34	446.01
November	202,592,025	6,753,067	1,482,259	. . .	73.40	453.44
December	198,115,813	6,390,832	555,791	. . .	69.46	429.11
Totals and averages	2,333,886,263	6,394,209	470,815	. .	69.18	429.21

Basis—Population Lynn and Saugus, estimated from census of 1905, [illegible]

Microscopical Examination of Water from Quannapowitt Lake.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1909.	January 15.	February 17.	March 17.	April 27.	May 20.	June 28.	July 27.	August 25.	September 25.	October 4.	November 26.	December 28.
Number of Sample . .	45819	46000	46169	46419	46589	46800	46986	47167	47600	47439	47828	48040
Plants.												
DIATOMACEÆ:												
Asterionella	0	1	2	6	118	0	0	0	0	0	0	0
Cyclotella	0	0	0	4	2	29	0	0	0	2	0	1
Navicula	0	0	0	0	0	2	1	1	0	2	0	0
Synedna	0	23	552	708	392	4	0	2	1	0	1	1
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	0	0	0	0	3	0	0
Oscillaria	0	0	0	0	0	3	0	0	0	3	0	0
ALGÆ:												
Protococcus	0	0	0	0	0	0	0	12	0	20	0	0
Raphidium	0	0	1	14	0	0	0	0	1	0	0	0
Scenedesmus	0	0	0	28	28	0	0	0	0	8	0	0
Animals.												
INFUSORIA:												
Cryptomonas	4	4	0	45	0	0	0	0	0	0	0	1
Dinobryon	6	2	40	172	0	0	0	0	0	0	0	0
Mallomonas	0	2	0	4	0	0	0	0	0	2	0	0
Peridinium	0	1	10	6	0	0	0	0	0	0	0	0
Synura	1	10	15	0	0	0	0	0	0	0	0	0
Trachelmonas . . .	17	0	1	2	6	2	0	1	0	1	0	0
Uroglena	0	1	0	12	0	0	0	0	0	0	0	0
Glenodinium	60	15	4	0	1	0	0	0	0	0	0	6
VERMES: Polyarthra .	0	0	0	0	1	0	0	0	0	0	0	0
CRUSTACEA: Cyclops .	0	0	.02	.02	0	0	.02	0	0	.02	0	0
FUNGI:												
Crenothrix	0	1	0	0	11	1	81	4	97	0	1	1
Zoöglœa	2	5	5	5	3	5	6	3	3	5	1	2
Total	90	71	630	1006	562	48	88	23	102	46	3	12

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TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1909

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	.10	. .	.31	. .	. .	. .	.34	. .	. .	. .
2	. .	. .	.09	.11	. .	. .	.28	. .	. .	. .	. .	. .
3	. .	. .	.20	. .	.06	. .	. .	. .	. .	. .	.47	. .
4	.10	. .	*.02	.01	. .	.03	. .	.40	. .	. .	. .	. .
5	.70	. .	. .	. .	. .	2.38	. .	.21	.02	. .	. .	. .
6	. .	. .	. .	. .	.07	. .	. .	. .	. .	. .	. .	. .
7	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.61
8	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
9	. .	*.92	.48	.09	. .	. .	. .	. .	. .	. .	. .	. .
10	. .	.43	. .	. .	.07	.40	. .	. .	.63	. .	. .	. .
11	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
12	.26	. .	. .	. .	. .	. .	. .	. .	. .	.09	. .	. .
13	*.01	. .	. .	. .	. .	.54	. .	. .	. .	. .	. .	*1.38
14	*.18	.04	. .	1 35	. .	. .	. .	. .	. .	.26	. .	. .
15	. .	.08	. .	.05	.11	. .	. .	. .	. .	.05	. .	. .
16	.07	*.44	.10	. .	.08	. .	1 34	. .	.06	. .	. .	. .
17	*.93	. .	. .	. .	.06	.52	. .	2.15	.17	. .	.04	. .
18	. .	. .	. .	. .	. .	. .	.32	. .	. .	. .	. .	. .
19	. .	.83	.15	.11	. .	. .	. .	. .	. .	. .	. .	. .
20	. .	. .	. .	. .	. .	. .	. .	.05	. .	. .	. .	. .
21	. .	. .	. .	.35	.24	. .	. .	. .	. .	.42	. .	. .
22	. .	.	. .	. .	.08	. .	. .	. .	.02	. .	.02	. .
23	.12	.68	. .	.46	. .	. .	.06	. .	.87	. .	*227	. .
24	.76	.96	. .	. .	. .	. .	. .	. .	.65	.38	3 13	. .
25	. .	. .	203	.01	. .	. .	. .	. .	. .	. .	.17	*.02
26	. .	. .	. .	. .	. .	. .	. .	. .	.80	. .	. .	*.20
27	.01	01	.30	.70	.45	. .	. .	. .	.40	. .	. .	. .
28	. .	. .	11	. .	. .	.13	. .	. .	.67	. .	.15	. .
29	*.34	. .	. .	.10	. .	. .	. .	.26	. .	. .	. .	. .
30	*.01	. .	. .	.47	. .	. .	.31	. .	. .	. .	. .	. .
31	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Total	12.11	3.55	3.58	3.81	1.53	4.00	2.31	3.07	4.63	1.20	4.25	3.11

* Snow.

Total for the year 39.52 inches.

The above rain-fall was measured by a standard gauge. This gauge is located in the rear of Pumping Station on vacant lot.

TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1900

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 . .	. .	. .	*.07	. .	.27	. .	. .	. .	. .	. .	. .	*.02
2 . .	. .	. .	.12	.09	. .	. .	. .	. .	. .	. .	. .	. .
3 . .	.03	. .	*.21	. .	.03	. .	.23	. .	. .	. .	.55	. .
4 . .	.10	. .	.06	. .	. .	.02	. .	.31	. .	. .	. .	. .
5 . .	.75	. .	. .	. .	. .	1.90	. .	.25	.10	. .	. .	. .
6 . .	. .	. .	. .	. .	.20	. .	. .	. .	. .	. .	. .	. .
7 . .	. .	. .	*.01	. .	. .	. .	. .	. .	. .	. .	. .	.54
8 . .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
9 . .	. .	*.62	.40	.11	. .	. .	. .	. .	. .	. .	. .	. .
0 . .	. .	.35	. .	. .	.05	.35	. .	. .	.45	. .	. .	. .
11 . .	.03	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
12 . .	*.27	. .	. .	. .	. .	. .	. .	. .	. .	.09	. .	. .
13 . .	*.09	. .	*.02	. .	. .	.40	. .	. .	. .	. .	. .	.60
14 . .	*.25	*.37	. .	1.15	. .	. .	. .	. .	. .	.27	. .	. .
15 . .	. .	.11	. .	.07	.11	. .	. .	. .	. .	.11	. .	. .
16 . .	*.27	*.52	*.08	. .	.05	. .	1.55	. .	.06	. .	. .	. .
17 . .	*1.12	. .	. .	. .	.06	.47	. .	1.82	.22	. .	.05	. .
18 . .	. .	. .	. .	. .	. .	. .	.26	. .	. .	. .	. .	. .
19 . .	*.01	.55	*.15	.07	. .	. .	.06	. .	. .	. .	. .	. .
20 . .	. .	. .	. .	. .	. .	. .	. .	.05	. .	. .	. .	. .
21 . .	. .	. .	. .	.23	.18	. .	. .	. .	. .	.40	. .	. .
22 . .	. .	. .	. .	. .	.07	.05	. .	. .	. .	. .	.02	*.02
23 . .	.11	.26	. .	.52	. .	. .	.03	. .	.61	.23	*.37	. .
24 . .	.73	.87	. .	. .	. .	. .	. .	. .	.77	.19	2.48	. .
25 . .	. .	. .	1.02	. .	. .	. .	. .	. .	. .	. .	.30	*.80
26 . .	. .	. .	. .	. .	. .	. .	. .	. .	.84	. .	. .	*.88
27 . .	*.06	*.05	.20	.72	.42	. .	. .	. .	.39	. .	. .	. .
28 . .	. .	. .	.26	. .	. .	.17	. .	.27	.40	. .	.15	. .
29 . .	*.50	. .	. .	.05	.03	. .	. .	. .	. .	. .	. .	*.02
30 . .	*.10	. .	. .	.29	. .	. .	.26	. .	. .	. .	. .	. .
31 . .	. .	. .	. .	. .	. .	. .	. .	.26	. .	. .	. .	. .
Total	4.42	3.70	2.60	3.30	1.47	3.36	2.39	2.96	3.84	1.29	3.92	2.88

*Snow.

Total for the year, 36.13 inches.

The above rain-fall was measured with a standard rain gauge. This gauge was formerly located on the roof of the City Hall and the results obtained were unsatisfactory due to roof structures, etc., and it was removed in 1900 to the roof of the stable on lot adjoining the City Hall grounds.

TABLE IV.

SHOWING THE AVERAGE DEPTH OF THE WATER IN PONDS FOR EACH WEEK DURING 1909.

WEEK ENDING	FEET.							
	Breed's Pond.		Birch Pond.		Walden Pond.		Hawkes Pond.	
	Ft.	In	Ft.	In	Ft.	In.	Ft.	In.
January 2	18	11	21	11	13	11	21	5
January 9	19	4	21	10	13	4	21	11
January 16	19	8	21	10	12	10	22	5
January 23	19	11	21	10	12	2	22	9
January 30	20	2	21	10	11	8	23	3
February 6	20	5	22	0	11	0	23	3
February 13	20	8	22	0	12	8	22	0
February 20	20	8	21	10	16	7	22	6
February 27	20	8	22	1	20	2	22	9
March 6	20	8	22	4	23	3	23	1
March 13	19	11	22	2	25	6	23	3
March 20	19	1	21	11	27	5	23	2
March 27	18	5	21	8	29	4	22	7
April 3	17	10	21	7	31	7	23	1
April 10	17	6	21	2	33	5	22	10
April 17	17	0	20	11	35	3	22	5
April 24	16	6	20	7	36	7	22	6
May 1	16	1	20	4	37	4	23	2
May 8	16	0	19	11	37	7	24	0
May 15	15	7	19	3	37	8	24	7
May 22	14	11	18	7	37	8	24	10
May 29	14	3	17	9	37	8	25	0
June 5	13	6	17	0	37	8	25	1
June 12	13	2	16	5	37	9	25	5
June 19	12	7	15	8	37	10	25	7
June 26	11	7	14	8	37	9	25	6
July 3	10	7	13	4	37	8	25	4
July 10	9	10	11	3	37	5	25	1
July 17	9	8	10	2	37	0	24	10
July 24	9	9	12	9	35	8	24	9
July 31	9	8	15	3	34	2	24	7
August 7	10	1	18	7	32	2	24	4
August 14	11	3	21	5	30	9	24	1
August 21	12	6	21	6	29	0	24	1
August 28	13	5	19	5	28	11	23	11
September 4	14	0	17	3	28	10	23	9
September 11	14	2	16	0	28	3	23	7
September 18	14	6	18	8	26	7	23	5
September 25	15	1	18	6	25	8	23	3
October 2	15	6	17	3	26	0	23	6
October 9	15	10	18	11	24	6	23	6
October 16	15	3	19	10	23	2	23	5
October 23	16	7	20	0	22	3	23	4
October 30	16	8	20	1	21	6	23	4
November 6	17	0	19	8	20	9	23	4
November 13	17	5	19	11	19	11	23	3
November 20	17	9	20	2	18	10	23	3
November 27	18	6	20	4	18	2	23	7
December 4	19	5	19	10	19	4	25	0
December 11	19	5	18	9	19	7	25	7
December 18	19	4	18	0	20	0	25	11
December 25	19	2	17	3	20	4	25	11

TABLE V.

COURT PIPES LAID IN 1909

	Size and Length.				
	1 in.	1¼ in.	1½ in.	2 in.	Total
Albany terrace	. .	14	. .	144	158
Boynton terrace	. .	. .	85	. .	85
Brightwood terrace	. .	. .	. .	67	67
Charles-street court	33	74	. .	. .	107
Cressey place	. .	. .	. .	106	106
Herbert street	. .	. .	. .	190	190
Hoag's court	. .	. .	. .	148	148
Hospital avenue	. .	. .	. .	256	256
Shepard court	. .	. .	45	162	207
283 Summer street	. .	. .	. .	137	137
Varney terrace	. .	. .	. .	175	175
Williams street	. .	. .	. .	148	148
Total	33	88	130	1,533	1,784

TABLE VI.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝-in.	¾-in.	1-in.	1½-in.	2-in.	3-in.	4-in.	Total
Lambert	1,420	1,644	227	45	44	...	...	3,380
Trident	748	797	94	4	1	...	...	1,644
Worthington	106	86	15	1	...	...	...	208
Thompson	43	123	27	4	...	1	1	199
Hersey	78	67	11	...	...	...	...	156
Nash	47	14	1	...	1	...	...	63
Niagara	23	16	1	...	...	...	...	40
Empire	11	9	4	4	3	1	1	33
Union	2	13	...	5	5	...	8	33
Ball and Fittings	9	7	9	...	...	...	...	25
Columbia	23	...	...	...	...	...	...	23
Crown	1	5	...	...	...	...	...	6
King	2	...	...	...	...	...	...	2
All others	4	...	1	2	...	2	...	9
Total	2,523	2,781	390	65	54	4	10	5,827

TABLE VII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1909.

STREET.	FROM	TO	Taken out	Size Inches and Length Feet 4	6	8	10	16	30	Total.
Bernice‡ . .	Wilfred . .	. . . .	. .	. .	260	.	. .	. .	. .	260
Bloomfield* .	Chatham . .	Autumn . .	6	. .	171	. .	. .	. .	. .	171
Boyce ct.* .	Liberty . .	End	2	161	. .	. .	. .	. .	. .	161
Broadway* .	Lynnfield .	Bacheller .	6	. .	. .	327	. .	. .	. .	327
Brookline* .	Chatham	. . . .	6	. .	. .	85	. .	. .	. .	85
Bro'nville av*	Essex . . .	Highla'd av.	4	. .	632	. .	. .	. .	. .	632
Charles* . .	Commercial	Prospect . .	4	. .	. .	784	. .	. .	. .	784
Chatham* . .	Lewis . . .	Sidney av. .	6	. .	. .	. .	. .	1,189	. .	1,189
Chatham* .	Essex . . .	Parrott . .	6	. .	. .	. .	. .	878	. .	878
Essex* . . .	Eastern av .	Swamp. line	6	. .	. .	. .	614	. .	. .	614
Essex ct. .	Essex . . .	End	6, 4	. .	437	. .	. .	. .	. .	437
Friend-st. pl.	Friend . . .	End	4	. .	490	. .	. .	. .	. .	490
Green* . . .	Broad . . .	Union . . .	6	. .	. .	1,630	. .	. .	. .	1,630
Hamilton av.†	Bay View av.	. . . . . .	. .	. .	298	. .	. .	. .	. .	298
Holly av.‡ .	Lynnfield .	. . . . . .	. .	590	. .	. .	. .	. .	. .	590
Hutcs'n's ct.*	Essex ct. .	. . . . . .	4	. .	296	. .	. .	. .	. .	296
Jenness† . .	Roanoke . .	. . . . . .	. .	228	. .	. .	. .	. .	. .	228
Laighton* .	Franklin . .	Lawton av.	12, 6	. .	. .	1,304	. .	. .	. .	1,304
Lawton av.*	Laighton .	Western av.	4	. .	. .	355	. .	. .	. .	355
Lynnfield* .	. . . . . .	Fair Oaks av	6	. .	772	. .	. .	. .	. .	772
Mudge† . .	Melvin av. .	No. 73 . . .	. .	. .	127	. .	. .	. .	. .	127
Norm'dy rd‡	Essex . . .	. . . . . .	. .	. .	353	. .	. .	. .	. .	353
No. Ames‡ .	Summer . .	Echo Gr. av.	. .	. .	240	. .	. .	. .	. .	240
Oakwood av.*	Chatham . .	Wellington	6	. .	. .	849	. .	. .	. .	849
Park rd.‡ . .	Colonial av.	Lynn Woods	. .	180	. .	. .	. .	. .	. .	180
Parrott* . .	Chatham . .	. . . . . .	6	. .	222	. .	. .	. .	. .	222
Pierce rd‡ . .	Ocean . . .	Boulevard .	. .	. .	392	. .	. .	. .	. .	392
Rad'n Gr. av†	End of pipe	. . . . . .	. .	372	. .	. .	. .	. .	. .	372
Sachem* . .	Sagamore .	Newhall . .	4	. .	709	. .	. .	. .	. .	709
Sand'rs'n av.*	Chatham .	. . . . . .	6	. .	63	. .	. .	. .	. .	63
Sheridan* . .	Essex . . .	Adams . .	4	. .	1,310	. .	. .	. .	. .	1,310
Sidney av.* .	Chatham . .	. . . . . .	6	. .	150	. .	. .	. .	. .	150
Silsbee* . .	Broad . . .	R. R. bridge	6	. .	. .	. .	654	. .	. .	654
Summer* . .	Opp. No. —	Hudson sq.	6	. .	. .	. .	. .	2,726	. .	2,726
Tilton ter* .	Essex . . .	End . . .	4	. .	481	. .	. .	. .	. .	481
Western av.*	Chestnut . .	Eutaw av. .	8	. .	. .	. .	. .	1,487	. .	1,487
West Green* .	Union . . .	Essex . . .	6	. .	555	. .	. .	. .	. .	555
Wheeler* . .	Blossom . .	Pleasant . .	4, 1½	. .	. .	926	. .	. .	. .	926
Williams av.*	Chatham .	Empire . .	4	. .	1,265	. .	. .	. .	. .	1,265
Walden Pond	. . . . . .	. . . . . .	. .	. .	. .	. .	. .	. .	212	212
Pine Gr. Cem‡	. . . . . .	. . . . . .	. .	1,212	. .	. .	. .	. .	. .	1,212
E.Sau.br'ge.*	12 in. . . .	. . . . . .	. .	. .	. .	. .	. .	. .	. .	36
*Whole street relaid. †Pipe extended. ‡New.				2,743	9,220	6,260	1,268	6,280	212	26,037

	MILES.	FEET.
Total length relaid	4	453
Total length extended		1,025
Total length new		3,227
Total length of system—Lynn, Saugus and Swampscott	141	933
Total length in Swampscott		1,788
Total length in Saugus	20	4,302

TABLE VI.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝-in.	¾-in.	1-in.	1½-in.	2-in.	3-in.	4-in.	Total
Lambert	1,420	1,644	227	45	44	. . .	. . .	3,380
Trident	748	797	94	4	1	. . .	. . .	1,644
Worthington	106	86	15	1	. . .	. . .	. . .	208
Thompson	43	123	27	4	. . .	1	1	199
Hersey	78	67	11	. . .	. . .	. . .	. . .	156
Nash	47	14	1	. . .	1	. . .	. . .	63
Niagara	23	16	1	. . .	. . .	. . .	. . .	40
Empire	11	9	4	4	3	1	1	33
Union	2	13	. . .	5	5	. . .	8	33
Ball and Fittings	9	7	9	. . .	. . .	. . .	. . .	25
Columbia	23	. . .	. . .	. . .	. . .	. . .	. . .	23
Crown	1	5	. . .	. . .	. . .	. . .	. . .	6
King	2	. . .	. . .	. . .	. . .	. . .	. . .	2
All others	4	. . .	1	2	. . .	2	. . .	9
Total	2,523	2,781	390	65	54	4	10	5,827

TABLE VII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1909.

STREET.	FROM	TO	Takenout	Size Inches and Length Feet						Total.
				4	6	8	10	16	30	
Bernice‡ . .	Wilfred . .	. . . .	. .	. .	200	.	. .	. .	. .	260
Bloomfield* .	Chatham . .	Autumn . .	6	. .	171	. .	. .	. .	. .	171
Boyce ct.* .	Liberty . .	End	2	101	. .	. .	. .	. .	. .	101
Broadway* .	Lynnfield .	Bacheller .	6	. .	. .	327	. .	. .	. .	327
Brookline* .	Chatham	. . . .	6	. .	. .	85	. .	. .	. .	85
Bro'nville av*	Essex . . .	Highla'd av.	4	. .	632	. .	. .	. .	. .	632
Charles* . .	Commercial	Prospect . .	4	. .	. .	784	. .	. .	. .	784
Chatham* . .	Lewis . . .	Sidney av. .	6	. .	. .	. .	. .	1,189	. .	1,189
Chatham* .	Essex . . .	Parrott . .	6	. .	. .	. .	. .	878	. .	878
Essex* . . .	Eastern av .	Swamp. line	6	. .	. .	. .	614	. .	. .	614
Essex ct. .	Essex . . .	End	6, 4	. .	437	. .	. .	. .	. .	437
Friend-st. pl.	Friend . . .	End	4	. .	496	. .	. .	. .	. .	496
Green* . . .	Broad . . .	Union . . .	6	. .	. .	1,639	. .	. .	. .	1,639
Hamilton av.†	Bay View av.	. . . .	. .	. .	298	. .	. .	. .	. .	298
Holly av.‡ .	Lynnfield .	. . . .	. .	590	. .	. .	. .	. .	. .	590
Hutcs'n's ct.*	Essex ct. .	. . . .	4	. .	296	. .	. .	. .	. .	296
Jenness† . .	Roanoke . .	. . . .	. .	228	. .	. .	. .	. .	. .	228
Laighton* .	Franklin . .	Lawton av.	12, 6	. .	. .	1,304	. .	. .	. .	1,304
Lawton av.*	Laighton .	Western av.	4	. .	. .	355	. .	. .	. .	355
Lynnfield* .	. . . .	Fair Oaks av	6	. .	772	. .	. .	. .	. .	772
Mudge† . .	Melvin av. .	No. 73 . . .	. .	. .	127	. .	. .	. .	. .	127
Norm'dy rd‡	Essex . . .	. . . .	. .	. .	353	. .	. .	. .	. .	353
No. Ames‡ .	Summer . .	Echo Gr. av.	. .	. .	240	. .	. .	. .	. .	240
Oakwood av.*	Chatham . .	Wellington	6	. .	. .	849	. .	. .	. .	849
Park rd.‡ . .	Colonial av.	Lynn Woods	. .	180	. .	. .	. .	. .	. .	180
Parrott* . .	Chatham . .	. . . .	6	. .	222	. .	. .	. .	. .	222
Pierce rd‡ . .	Ocean . . .	Boulevard .	. .	. .	392	. .	. .	. .	. .	392
Rad'n Gr. av†	End of pipe	. . . .	. .	372	. .	. .	. .	. .	. .	372
Sachem* . .	Sagamore .	Newhall . .	4	. .	709	. .	. .	. .	. .	709
Sand'rs'n av.*	Chatham .	. . . .	6	. .	63	. .	. .	. .	. .	63
Sheridan* . .	Essex . . .	Adams . .	4	. .	1,310	. .	. .	. .	. .	1,310
Sidney av.* .	Chatham . .	. . . .	6	. .	150	. .	. .	. .	. .	150
Silsbee* . .	Broad . . .	R. R. bridge	6	. .	. .	. .	654	. .	. .	654
Summer* . .	Opp. No. —	Hudson sq.	6	. .	. .	. .	. .	2,726	. .	2,726
Tilton ter* .	Essex . . .	End . . .	4	. .	481	. .	. .	. .	. .	481
Western av.*	Chestnut . .	Eutaw av. .	8	. .	. .	. .	. .	1,487	. .	1,487
West Green*	Union . . .	Essex . . .	6	. .	555	. .	. .	. .	. .	555
Wheeler* . .	Blossom . .	Pleasant . .	4, 1½	. .	. .	926	. .	. .	. .	926
Williams av.*	Chatham .	Empire . .	4	. .	1,265	. .	. .	. .	. .	1,265
Walden Pond	. . . .	. . . .	. .	. .	. .	. .	. .	. .	212	212
Pine Gr.Cem‡	. . . .	. . . .	. .	1,212	. .	. .	. .	. .	. .	1,212
E.Sau.br'ge.*	12 in. . . .	. . . .	. .	. .	. .	. .	. .	. .	. .	30
*Whole street relaid. †Pipe extended. ‡New.				2,743	9,220	6,260	1,268	6,280	212	20,037

	MILES.	FEET.
Total length relaid	4	453
Total length extended		1,025
Total length new		3,227
Total length of system—Lynn, Saugus and Swampscott	141	633
Total length in Swampscott		1,788
Total length in Saugus	20	4,392

TABLE VIII.

SHOWING THE TOTAL LENGTH IN FEET AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1909.

	6-in.	4-in.	2-in.	1½-in.	1¼-in.	1-in.	¾-in.	Total
Lynn	43	9	481	236	1,993	8,937	4,810	10,518
Saugus	. .	. .	. .	64	173	1,498	2,109	3,844
Total	43	9	481	300	2,166	10,435	6,928	20,302

TABLE IX.

SHOWING THE LOCATION AND SIZE OF GATES SET IN 1909.

STREET.	LOCATION.
Albany terrace.....	2-inch valve. On the line of the south side of Albany street, 2 feet, 10 inches west of the east side of Albany terrace.
Ashland...........	6-inch gate. 1 foot, south of the south line of Boston street, 18 feet, 6 inches west of the east side of Ashland street.
Ashland...........	16-inch gate. On the line of the east side of Summer street, 23 feet, 2 inches north of the south side of Ashland street.
Bessom............	6-inch gate. 6-inches south of the north line of Essex street, 21 feet, 4 inches east of the west side of Bessom street.
Bloomfield.........	6-inch gate. 6-inches west of the west line of Chatham street, 17 feet, 2 inches south of the north side of Bloomfield street.
Boyce court........	4-inch gate. On the line of the south side of Liberty street, 3 feet 10 inches east of the west side of Boyce court.
Boynton terrace....	1-½-inch valve. On the line of the north side of Lewis street, 2 feet west of the east side of Boynton terrace.
Brightwood terrace.	2-inch valve. 7 feet south of the north side of Essex street, 2 feet, 9 inches east of the west side of Brightwood terrace.
Broadway	6-inch gate. 1 foot west of the west side of Euclid avenue, 16 feet 8 inches south of the north side of Broadway.
Broadway	8-inch gate. On the line of the east side of Lynnfield street, 34 feet 9 inches south of the north side of Broadway.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Brookline	8-inch gate. 1 foot east of the east line of Chatham street, 20 feet south of the north side of Brookline street.
Brownville avenue.	6-inch gate. 6-inches south of the north line of Essex street, 4 feet, 6 inches west of the east side of Brownville avenue.
Brownville avenue.	6-inch gate. On a line with the west side of Highland avenue, 8 feet 7 inches north of the south side of Brownville avenue.
Charles	8-inch gate. On the line of the east side of Commercial street, 21 feet, 5 inches south of the north side of Charles street.
Charles	8-inch gate. 6 inches east of the west line of Prospect street, 13 feet, 4 inches south of the north side of Charles street.
Chatham	16-inch gate. On the line of the south side of Bloomfield street, 17 feet 2 inches east of the west side of Chatham street.
Chatham	16-inch gate. 1 foot south of the south line of Essex street, 19 feet, 4 inches east of the west side of Chatham street.
Chatham	6-inch gate. 6 inches north of the north line of Essex street, 16 feet, 3 inches west of the east side of Chatham street.
Chatham	16-inch gate 1 foot north of the north line of Lewis street, 12 feet, 4 inches east of the west side of Chatham street.
Coburn	6-inch gate. On the line of the north side of Essex street, 23 feet, 4 inches east of the west side of Coburn street.
Crescent	6-inch gate. 1 foot east of the east line of Chatham street, 8 feet, 1 inch south of the north side of Crescent street
Cressey place	2-inch valve. On the line of the west side of Johnson street, 7 feet, 9 inches north of the south side of Cressey place.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Dana	4-inch gate. On the line of the north side of Williams avenue, 13 feet, 9 inches west of the east side of Dana street.
Essex court	6-inch gate On the line of the north side of Essex street, 8 feet, 4 inches east of the west side of Essex court.
Eutaw avenue	16-inch gate. On the line of the south side of Western avenue, 17 feet, 2 inches west of the east side of Eutaw avenue.
Evelyn	4-inch gate. On the line of the north side of Oakwood avenue, 17 feet east of the west side of Evelyn street.
Friend-street place	6-inch gate. On the line of the south side of Friend street, 15 feet, 9 inches west of the east side of Friend-street place.
Friend	6-inch gate. On the line of the west side of Green street, 14 feet 3 inches north of the south side of Green street.
Graves avenue	6-inch gate. On the line of the south side of Western avenue, 16 feet, 5 inches west of the east side of Graves avenue
Green	8-inch gate. On the line of the north side of Broad street, 17 feet, 5 inches west of the east line of Green street.
Green	8-inch gate. On the line of the south side of Union street, 34 feet, 10 inches east of the west side of Green street.
Hamilton avenue	6-inch gate. 4 feet, 2 inches west of the east line of Bay View avenue, 15 feet, 9 inches north of the south line of Hamilton avenue.
Hoag's court	2-inch valve. On the line of the east side of Commercial street, 7 feet, 11 inches north of the south side of Hoag's court.
Holly avenue	4-inch gate. On the line of the north side of Lynnfield street, 4 feet east of the west side of Holly avenue

TABLE IX.—*Continued.*

STREET	LOCATION.
Hospital avenue ...	2-inch valve. On the line of the east side of Franklin street, 25 feet north of the south side Hospital avenue.
Laighton	8-inch gate. On the line of the west side of Washington, 20 feet, 9 inches south of the north side of Laighton street
Laighton	8-inch gate On the line of the east side of Washington street, 17 feet, 2 inches north of the south side of Laighton street.
Laighton	8-inch gate. 1 foot east of the west side of Lawton avenue, 17 feet, 11 inches north of the south side of Laighton street.
Laighton avenue ..	8-inch gate On the line of the south side of Western avenue, 14 feet east of the west side of Lawton avenue.
Mildred	4-inch gate. On the line of the west side of Summer street, 16 feet north of the south side of Mildred street.
Midge.......... ...	[illegible]-inch gate. On the line of the south side of Melvin avenue 15 feet 3 inches west of the east side of Midge street
North Ames.... .	[illegible]-inch gate On the line of the west side of North Ames street
Oakwood avenue.	8-inch gate On the line of the east side of Chatham street, 11 feet [illegible] inches south of the north side of Oakwood avenue
Oakwood avenue...	8-inch gate On the line of the west side of Wellington street, 16 feet 1 inch south of the north side of Oakwood avenue.
Pierce road..	[illegible]-inch gate On the line of the north side Boulevard 18 feet west of the east side of Pierce road
Pierce road	[illegible]-inch gate On the line of the south side of Ocean street 18 feet 8 inches west of the east side of Pierce road
Porter	6-inch gate On the line of the north side of Essex street 14 feet 3 inches east of the west side of Porter street

TABLE IX.—*Continued.*

STREET.	LOCATION.
Sachem	6-inch gate. On the line of the east side of Newhall street, 18 feet south of the north side of Sachem street.
Seymour avenue	6-inch gate. On the line of the east side of Chatham street, 6 feet 11 inches south of the northside of Seymour avenue.
Sheridan	6-inch gate. On the line of the south side of Adams street, 18 feet, 10 inches west of the east side of Sheridan street.
Sheridan	6-inch gate. On the line of the north side of Essex street, 19 feet, 7 inches west of the east side of Sheridan street.
Silsbee	10-inch gate. On the line of the north side of Broad street, 20 feet, 8 inches east of the west side of Silsbee street.
State	10-inch gate. On the line of the east side of Pleasant street, 16 feet, 6 inches south of the north side of State street.
Summer	16-inch gate. 1 foot south of the south side of Ames street, 34 feet, 11 inches east of the west side of Summer street.
Summer	16-inch gate. On the line of the east side of Houston street, 102 feet, 3 inches from the west corner of Houston and Boston street
Summer	16-inch gate. 15 feet, 1 inch from the east side of Summer street, 25 feet, 2 inches southwest of hydrant on a line with the dividing line between Little River Playground and Structural Cement Stone Co.
Summer	10-inch gate. 19 feet, 10 inches from building No 627, 11 feet, 5 inches northwest of hydrant
Temple place	4-inch gate. On the line of the east side of Summer street, 12 feet, 10 inches south of the north side of Temple place
Tilton terrace	6-inch gate. On the line of the south side of Essex street, 12 feet, 5 inches east of the west side of Tilton terrace

TABLE IX.—*Continued.*

STREET.	LOCATION.
Western avenue....	16-inch gate. On the line of the east side of Chestnut street, 17 feet, 3 inches south of the north side of Western avenue.
Western avenue....	16-inch gate. On the line of the west side of Grover avenue, 15 feet, 7 inches south of the north side of Western avenue.
West Green........	6-inch gate. On the line of the south side of Essex street, 10 feet, 3 inches east of the west side of West Green street.
West Green	6-inch gate. On the line of the north side of Union street, 7 feet, 3 inches east of the west side of West Green street.
Wheeler...........	8-inch gate. On the line of the east side of Blossom street, 16 feet, 5 inches south of the north side of Blossom street.
Wheeler...........	8-inch gate. On the line of the east side of Church street, 16 feet, 3 inches south of the north side of Wheeler street.
Wheeler...........	8-inch gate. On the line of the west side of Pleasant street, 17 feet, 9 inches south of the north side of Wheeler street.
Williams avenue ...	6-inch gate. On the line of the east side of Chatham street, 12 feet, 4 inches south of the north side of Williams avenue.
Williams avenue...	6-inch gate. On the line of the west side of Dana street, 11 feet, 1 inch south of the north side of Williams avenue.
Williams avenue...	6-inch gate. On the line of the west side of Empire street, 14 feet, 1 inch south of the north side of Williams avenue.
Williams	2-inch valve. On the line of the south side of Springvale avenue, 17 feet, 1 inch west of the east side of Williams street.

TABLE X.

SHOWING LOCATION, SIZE AND KIND OF HYDRANTS SET IN 1900

Alice avenue, between 16 and 20	*6 Walker
Apple street, between 32 and 36	*6 Walker
Arlington street, between 41 and 45	6 Walker
Astor street, front of 34	*6 Walker
Barrett court, front of 25	*6 Walker
Beede avenue, corner Henry avenue	*6 Walker
Boston street, City Home	*6 Walker
Brownville avenue, front of 26	6 Walker
Brownville avenue, between 34 and 44	6 Walker
Brownville avenue, corner Essex street	6 Walker
Charles street, corner West	6 Walker
Chatham, between 40 and 42	6 Walker
Chatham, corner Chatham place	**6 Boston
Chatham, front of 144	6 Walker
Chatham, corner Ireson avenue	6 Walker
Chestnut, corner Olive street	* 6 Walker
Colonial avenue	6 Walker
Essex street, corner Mountain avenue	6 Walker
Essex court, between 10 and 14	6 Walker
Ezra street, opposite Mailey	6 Walker
Fairchild street	*6 Walker
Federal street, corner Boston	*6 Walker
Friend-street place, front of 8	6 Walker
Friend-street place, end of pipe	**4 Boston
Gertrude, corner President	*6 Walker
Green, between 124 and 130	6 Walker
Green street, front at 26	6 Walker
Green street, corner Howard	6 Walker
Hamilton avenue, end of pipe	6 Walker
Kirtland street, corner Boston	*6 Walker
Laighton, between 52 and 54	6 Walker
Laighton, between [illegible] and [illegible]	6 Walker
Light street, front of [illegible]	*6 Walker
Linden street, front [illegible]	*6 Walker
Linden street, front [illegible]	*6 Walker
Melvin avenue, front of [illegible]	6 Holyoke
Nahant place, end of pipe	*6 Walker

Normandy road, end of pipe	6 Walker
Oakwood avenue, front of schoolhouse	6 Walker
Oakwood avenue, corner Evelyn	6 Walker
Pearl street, front 67	6 Walker
Pearl street, front 17	6 Walker
Pierce road, corner Boulevard	6 Walker
Raddin Grove avenue	4 Holyoke
Sachem street, between 11 and 15	6 Walker
Sachem street, corner Sachem avenue	**6 Walker
Sheridan, between 25 and 27	**6 Walker
Sheridan, between 63 and 67	6 Walker
Silsbee street, front of 87	6 Walker
Summer, east side of bridge	6 Walker
Summer, opposite 682	6 Walker
Summer, corner Temple place	6 Walker
Tilton terrace, front of 17	6 Walker
Tilton terrace, end of pipe	4 Walker
Union, corner Chestnut	6 Walker
Washington, corner Munroe	8 Walker
Western avenue, opposite Eutaw avenue	6 Walker
Western avenue, opposite Graves avenue	6 Walker
Western avenue, corner Goldthwait	6 Walker
Wheeler, opposite Wheeler court	6 Walker
Wheeler street, 72 feet from Blossom street	6 Walker
Williams avenue, between 65 and 67	6 Walker
Williams avenue, between 121 and 125	6 Walker
Williams avenue, corner Empire street	**6 Holyoke
Willow, corner Oxford	6 Walker
Willow street, No. 17	8 Walker
Willow, corner Blake	8 Walker

*Renewed.

**Moved.

Flow of Water Over Weirs, Foot of Walden Pond Dam

(Gallons per 24 Hours.)

Date [illegible]	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
January [illegible]	13 3	5,803	1,758	....	1,780	2,803	....	2,444	3,687	108,738
January [illegible]	12 11	5,803	1,758	....	1,780	2,803	....	4,616	3,687	105,015
January [illegible]	12 [illegible]	5,803	931	....	942	2,803	....	2,444	3,687	165,615
January [illegible]	11 [illegible]	[illegible]	931	....	942	2,803	....	4,616	7,895	231,5[illegible]
February [illegible]	11 [illegible]	1,931	310	...	942	2,803	....	814	1,020	[illegible]
February [illegible]	11 [illegible]	5,803	1,758	....	942	5,100	....	2,444	5,761	23[illegible]
February [illegible]	15 [illegible]	5,803	1,758	....	1,780	9,574	....	4,616	13,220	3[illegible]4,731
February 23	19 2	10,950	1,758	....	1,042	9,574	....	7,332	10,204	314,17[illegible]
March [illegible]	22 [illegible]	17,4[illegible]	1,758	....	1,780	5,100	....	7,332	10,204	3[illegible]4,731
March [illegible]	25 1	[illegible]	931	454	1,780	[illegible]	....	13,367	16,[illegible]	3[illegible]1,17[illegible]
March [illegible]	[illegible]	[illegible]	1,758	454	1,780	1,802	...	10,337	19,204	[illegible]
March [illegible]	28 [illegible]	[illegible]	4,793	454	2,525	2,803	[illegible]	16,[illegible]	22,405	4[illegible]
March [illegible]	[illegible]	100,580	3,587	1,802	2,525	2,803	3,027	21,442	20,446	5[illegible]
A[illegible]	[illegible]	[illegible]	1,758	1,802	2,525	5,100	3,027	21,442	20,446	5[illegible]
April [illegible]	[illegible]	124,423	2,793	2,803	2,525	3,023	3,027	28,5[illegible]5	20,446	[illegible]
A[illegible]	[illegible]	15[illegible]	4,793	2,803	2,525	3,023	5,701	32,501	37,128	468,013
A[illegible]	[illegible]	150,[illegible]	3,587	3,443	3,575	5,100	5,701	32,501	41,172	7[illegible]6,624
M[illegible]	[illegible]	[illegible]	3,587	3,443	2,525	5,100	5,701	32,501	45,450	75[illegible]
M[illegible]	[illegible]	177,031	4,793	2,803	2,525	5,100	5,701	32,501	37,128	7[illegible]
M[illegible]	[illegible]	177,031	3,587	2,803	3,575	9,574	5,701	32,501	37,128	7[illegible]6,621
[illegible]	[illegible]	177,031	3,587	2,803	3,575	9,574	5,701	28,5[illegible]5	33,278	7[illegible]6,621
[illegible]	[illegible]	177,031	3,587	3,443	3,575	9,574	5,701	28,5[illegible]5	20,446	[illegible]58,013
[illegible]	[illegible]	[illegible]	3,587	3,443	3,575	9,574	[illegible]	32,501	37,128	750,62[illegible]
[illegible]	[illegible]	[illegible]	3,587	3,443	3,575	9,574	[illegible]	32,501	33,27[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	3,587	3,443	3,575	9,574	5,701	32,501	20,446	[illegible]58,013
[illegible]	[illegible]	[illegible]	3,587	3,443	3,575	9,574	[illegible]	28,51[illegible]	25,[illegible]	[illegible]

Flow of Water Over Weirs, Foot of Walden Pond Dam—*Continued*

(Gallons per 24 Hours)

Date [illegible]	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
July 5	37-0	200,200	3,827	3,023	3,875	6,574	5,761	28,515	25,819	700,624
July 12	37-3	192,114	2,703	2,803	2,828	6,574	5,761	28,515	22,405	658,043
July 19	36-3	221,769	5,069	3,923	3,875	6,574	5,761	32,801	33,278	865,614
July 26	34-9	192,114	3,703	2,803	2,828	5,196	3,047	28,515	22,405	658,043
August 2	32-10	221,769	3,847	2,803	2,828	3,923	1,920	24,442	16,003	600,403
August 9	30-7	200,206	2,703	1,802	2,828	3,923	1,920	24,442	13,229	560,882
August 16	28-10	124,423	1,758	1,802	1,780	2,863	1,920	24,442	10,455	514,510
August 23	29	137,310	1,758	1,802	1,780	2,863	640	32,801	13,229	470,346
August 30	28-10	137,310	1,758	1,802	1,780	2,863	1,920	28,515	10,455	470,346
September 6	28-9	137,310	1,758	1,802	1,780	1,802	1,920	32,801	10,455	470,346
September 13 . . .	27-1	100,509	1,758	1,802	2,828	2,803	640	32,801	10,455	470,340
September 20 . . .	25-10	67,091	1,758	954	1,780	1,802	640	24,442	7,895	384,226
September 27 . . .	26	67,091	1,758	954	1,780	1,802	640	37,477	16,003	560,882
October 4	24-10	58,021	1,758	954	1,780	1,802	640	32,861	10,455	385,226
October 11	23-6	31,589	1,758	954	1,780	954	. . . .	20,368	7,895	304,731
October 18	22-	23,853	1,758	954	942	954	. . . .	13,307	5,761	207,192
October 25	21-9	17,400	1,758	954	942	954	. . . .	10,048	10,455	384,226
November 1	20-11	17,400	931	318	942	318	. . . .	10,048	5,761	231,861
November 8	20-3	10,059	931	318	942	318	. . . .	7,332	5,761	231,861
November 15	19-2	10,059	931	954	942	954	. . . .	13,307	3,627	231,861
November 22	18-3	10,059	931	318	942	954	. . . .	7,332	3,627	198,758
November 29	19-3	17,400	931	954	1,780	954	. . . .	7,332	19,204	384,226
December 6	19-6	10,059	931	954	942	318	. . . .	7,332	7,895	231,861
December 13	19-0	10,059	931	318	942	954	. . . .	7,332	7,895	231,861
December 20	20-3	. . . .	931	318	942	954	. . . .	7,332	7,895	. . . .
December 27	20-7	. . . .	931	. . . .	1,780	1,802	. . . .	10,048	10,455	. . . .

CHIEF INSPECTOR'S REPORT.

LYNN, MASS., January 1, 1910.

The Public Water Board:

GENTLEMEN,—I have the honor to submit the following report of the Inspectors for the year 1909.

W. B. MOULTON.—Reading 12,798 meters, inspecting 5,113 houses, delivered 8,234 water bills, delivered 1,098 summons, nine days special for Superintendent and Registrar, three days sorting water bills, one day collecting, twelve days vacation

JOHN CHAMBERLAIN.—Reading 8,019 meters, inspecting 7,004 houses, delivered 2,703 water bills, delivered 583 summons, six days special for W. O. Mudge, three days sorting water bills, eleven days collecting, twenty-six days sick and vacation.

F. E. SPRAGUE.—Reading 11,742 meters, inspecting 7,961 houses, delivered 4,263 water bills, delivered 813 summons, two days special for W. O. Mudge, three days sorting water bills, eleven days collecting, fifteen days sick and vacation.

H. L. NILES.—Reading 8,906 meters, inspecting 6,730 houses, delivered 3,998 water bills, delivered 569 summons, three days sorting bills, thirty-five days collecting, eighteen days away and vacation.

J. E. DRISCOLL.—Reading 17,567 meters, inspecting 6,466 houses, delivered 9,288 water bills, delivered 1,098 summons, three days sorting bills, nine days special for W. O. Mudge; ten days collecting, twelve days vacation.

J. F. POOL.—Verifying 33,274 inspections with books, verifying 58,820 meter readings with books, making 44,563 inspection blanks, issued 1,160 leak notices, changed 1,215 meters, found 1,981 filters, sixteen days sorting water bills and summons, six days making meter slips, twelve days vacation.

ADDITIONAL FIXTURES —One hundred and thirty-eight families, 248 faucets, 136 bath tubs, 242 water closets, 107 set tubs, 33 heaters, 75 horses, 23 cows.

Respectfully submitted,

(Signed) J. F. POOL,

Chief Inspector.

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1909.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population (estimated) Lynn and Saugus,	90,000
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and Saugus river
Mode of supply,	Pumping to reservoir and stand pipe.

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a*. Kind, soft coal.
   - *b*. Brand of coal used, Georges Creek.
   - *c*. Average price of coal per gross ton, delivered, $4.35.
   - *d*. Percentage of ash, 12.66.
   - *e*. Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,605,900	95,900	1,800

liary.

1,800

1,325

14.47

15.47

68

liary.

1,445

SES.

7.00

.05

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ASTOR, LENOX AND TILDEN FOUNDATIONS

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1909.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population (estimated) Lynn and Saugus,	90,000
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and Saugus river
Mode of supply,	Pumping to reservoir and stand pipe.

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1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
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   - *b.* Brand of coal used, Georges Creek.
   - *c.* Average price of coal per gross ton, delivered, $4.35.
   - *d.* Percentage of ash, 12.66.
   - *e.* Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,605,900	95,900	1,800

liary.

1,800

2,325

14·47

15·47

68

liary.

2,445

SES.

7.00

.05

I

Po

Da

Ov

So

Mo

1.

2.

3.

		Loretz.	Leavitt.	Auxiliary.
4.	[Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,		none.	
4*a*.	Amount of other fuel used,		none	
5.	Total equivalent coal consumed for the year =(3)+(4), in pounds,	3,605,900	95,900	1,800
6.	Total pumpage for the year, in gallons, with allowance for slip,	2,171,814,750	65,526,800	302,325
7.	Average static head against which pumps work, in feet,	146.45	153 88	214.47
8.	Average dynamic head against which pumps work, in feet,	148.32	154.38	215.47
9.	Number of gallons pumped per pound of equivalent coal (5),	602.3	683.3	168

10. $\text{Duty} = \frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5).}}$

Loretz.	Leavitt.	Auxiliary.
74,503,189	87,974,628	30,182,445

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

11.	Per million gallons pumped,	$7.00
12.	Per million gallons raised one foot (dynamic),	.05

FINANCIAL STATISTICS.

RECEIPTS.		
From meter rates	$150,647.85	
From fixture rates	116,697.06	
	$267,344.91	
From other sources		$14,757.66
Balance from 1908 construction		3,044.90
		$285,147.47

EXPENSES.		
Maintenance	$147,177.62	
Interest	67,515.00	
Sinking funds	54,756.00	
Rebate to Saugus	6,816.80	
Construction	300.85	
Balance to maintenance	5,837.15	
Balance to construction	2,744.05	
		$285,147.47

Net cost of works to date	$2,966,946.48
Bonded debt to date	1,658,500.00
Value of Sinking Fund	503,978.26
Average rate of interest, 3¾ per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1.	Estimated population at date,	90,000
2.	Estimated population on lines of pipe,	90,000
3.	Estimated population supplied,	90,000
4.	Total consumption for the year (gallons),	2,333,886,263
5.	Passed through meters (gallons),	835,000,000
6.	Percentage of consumption metered,	28 per cent
7.	Average daily consumption in gallons,	6,394,209
8.	Gallons per day to each inhabitant,	69.48
9.	Gallons per day to each consumer,	69.48
10.	Gallons per day to each tap,	429.21
11.	Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$63.00
12.	Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$90.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1.	Kind of pipe,	Cement-lined, and cast-iron.
2.	Sizes,	From 36 to 4 inch.
3.	Extended during year (feet),	1,025

4. Renewed during year (feet).	21,573
5. Total now in use (miles).	141 –
6. Cost of repairs per mile.	$60.00
7. Number of leaks per mile.	.075
8. Length of pipes less than 4 inches diameter (miles).	Courts only
9. Number of hydrants added during year	25
10. Number of hydrants (public and private) now in use.	1,117
11. Number of stop gates added during year.	24
12. Number of stop gates now in use.	1,265
13. Number of stop gates smaller than 4-inch.	94
14. Number of blow-offs.	75
15. Range of pressure on mains (pounds).	40 to 60

SERVICES.

16. Kind of pipe.	Cement-lined and lead-lined
17. Sizes (inches).	¾ to 4
18. Extended (feet).	13,240
19. Discontinued (feet).	848
20. Total now in use (miles).	117
21. Number of service taps added during year.	302
22. Number now in use.	14,876
23. Average length of service (feet).	40
24. Average cost of service for the year.	$18.00
25. Number of meters added.	420

26. Number now in use,	5,827
27. Percentage of services metered,	40 per cent
28. Percentage of receipts from metered water (B + C),	55 per cent.
29. Number of motors and elevators added,	1
30. Number now in use,	5

Plans for a Higher Pressure Water Service in Lynn.

MARCH 1ST, 19[illegible].

To the Honorable the Mayor and the City Council:

GENTLEMEN, — An order of the City Council approved by the Mayor on January [illegible], reads: — "That the Water Board estimate the probable cost of making the water system of the City of Lynn on a high pressure service and report findings to the City Council on or before March 1st, [illegible]."

In accordance with this order we have prepared a general report covering the problem as far as possible in the time available.

Present System.

Water for most of the city is supplied from the 20,000,000 gallon reservoir on Pine Hill, elevation [illegible] above mean low tide. [illegible] is supplied from [illegible] Pine Hill [illegible] of high [illegible] reservoir goes to the [illegible] main. From [illegible] the high service sections. [illegible] system, the general [illegible] system as a whole.

Pressures [illegible] gauge in the Water Board [illegible] City Hall lawn, and [illegible] above mean low tide. The low service system [illegible] as this supplies the larger part of the area of the city and all of the concentrated values. The maximum pressure at the Water Board office due to the head of the low service reservoir is about 63 pounds; the pressure is now cut down a few pounds by a reducing valve. This on account of the weak cement pipe yet remaining which breaks more rapidly if the pressure is materially increased. The work now proposed for the year will remove all of the especially weak pipe so that probably by summer the reducing valve can be removed and the full capacity of the mains utilized in holding up the pressure.

With the reducing valve taken out the pressure at night at the Water Board office will go to nearly 63 pounds. This pressure drops as morning approaches and the use of water commences until at about 8 o'clock it will go down to 50 pounds, and on days in summer when the draft is extra heavy, even to several pounds below this; it begins to rise towards noon, averaging materially better in the afternoon than in the morning, and by 10 or 11 o'clock at night will be up to about 60 pounds. Diagram 1 attached shows this pressure just as it was recorded for January 21st and 22, 1909, when the reducing valve was removed in order to get a record of pressures with it out of service.

A very complete examination of the water system was made by the engineers of the National Board of Fire Underwriters in July and August, 1908. As a part of this investigation exhaustive tests were made in various parts of the city to determine the quantities of water that could be drawn for fire purposes. While such drafts were going on pressures were noted and full data obtained. The Water Board co-operated fully in these tests and they were conducted in a way to give the fullest information on all of these points. In this connection the tests made at four points where very large quantities of water were drawn are of interest, and we have plotted them on Diagram 1.

A test at the corner of Summer and Pleasant streets drawing about 5,700 gallons per minute (or the equivalent of about 22 fire streams) drew the pressure in the Water Board office to 24 pounds.

A test at the corner of Summer and Market streets drawing sbout 8,300 gallons per minute (or the equivalent of about 33 hose streams) drew the pressure in the Water Board office to 17 pounds.

Two other tests as the diagram indicates drew the pressure to 25 pounds in one case and 30 pounds in another. These are very large reductions and indicate that any material increase in the amount of water called for would have resulted in drawing the pressure so low that the water could not have been obtained.

Fire Streams.

It is assumed that if any increase in pressure was made it would be desirable to raise the pressure sufficiently so that good fire streams could be obtained from the hydrants without the use of steam fire engines. A brief consideration of what is necessary for an efficient fire stream is therefore desirable.

The standard fire stream is that from 1 1-8 inch nozzle, discharging 250 gallons per minute. This, when there is only a moderate wind blowing, will be thrown in solid form to a height of 70 feet so that it would be effective in a five to six story building. The average of the highest drops will go a height of 94 feet. Where fire streams are used there is a large loss in pressure by friction in the hose so that the longer the hose lines the higher the pressure at the hydrant or steamer must be. The table below shows the hydrant pressures necessary to give standard 1 1-8 inch, 250 gallon streams, with different lengths of hose, no steam fire engine being in use.

100 feet of hose must have 63 pounds at hydrant
200 feet of hose must have 77 pounds at hydrant
300 feet of hose must have 92 pounds at hydrant
400 feet of hose must have 106 pounds at hydrant
500 feet of hose must have 120 pounds at hydrant
1,000 feet of hose must have 192 pounds at hydrant

For ordinary fire fighting conditions, even where hydrants are spaced closely together, hose lengths of 250 to 300 feet will be necessary, so it is evident from the table that hydrant pressures maintained at about 90 pounds are necessary for good hose streams where buildings five and six stories in height must be protected.

With 300-feet of hose a hydrant pressure of 63 pounds gives only a fair stream, the discharge being about 200 gallons per minute and the effective height of the stream about fifty feet

Therefore pressures of about 60 pounds with short hose lines would be reasonably satisfactory for buildings of three or four stories, but would be insufficient for higher buildings.

The amount of water needed for a large fire cannot be exactly estimated, but in a city of the size and character of Lynn it is considered that the supply at serviceable pressure for fire purposes in the congested value or business district should be about 10,000 gallons per minute. This is equivalent to forty fire streams. Except for a very severe conflagration 40 streams would not be used, but in any considerable fire a large amount of water might be used through automatic sprinklers and through connections for standpipes and for other purposes some of which are sure to be broken when any destructive fire is in progress. It is therefore considered that 10,000 gallons per minute is an entirely reasonable supply for fire streams and for such wastes as are bound to occur. It is understood that this amount of water must be furnished in addition to the ordinary consumption.

Plans for High Pressure Service.

In Lynn a number of plans are possible, anyone of which would materially improve the fire service available from the water system. There has not been time to perfect any plan in all detail, but the several possible plans are outlined below in sufficient detail to show about what is feasible.

Plan I — New Main from Present Reservoir.

Lay a new large main, probably 30-inch, from the present low service reservoir to the center of the city. Such a main would keep the pressure at the Water office gauge ordinarily between 60 and 63 pounds, and would not let it get below about 50 pounds even with a fire draft of 10,000 gallons per minute plus the ordinary consumption. On Diagram I, a line has been plotted which indicates about the way the pressure would vary with such a new main.

Such a 30-inch pipe from the reservoir to the center of the city would be about 8,500 feet in length and would cost about

$60,000. With any such new main it would also be desirable to reinforce the gridiron system in various sections so that an ample volume of water could be delivered at any part of the city, through some little distance away from the large main feeders. This, however, is simply in line with the general strengthening of the whole system which the Board are working upon whenever any pipe is laid, following a plan already generally developed so that in the end a complete and harmonious system will result.

Plan II – Standpipe on High Rock.

There is a considerable area on High Rock at elevation 170. It would be feasible to construct there a reinforced concrete standpipe about 125-feet in diameter by 90-feet depth of water, containing 8,000,000 gallons. When full the water level would be at elevation 260, and this would give a pressure of 95-pounds at the Water Board office gauge. When the standpipe was practically empty the pressure at the gauge would be about 55 pounds.

Such a standpipe could be made in attractive form with a wide gallery around the top, giving an excellent observation point. The conditions, however, under which the High Rock land is now held might make it impossible to use it for such a purpose. There are other available sites in the Highland District of about the same elevation, upon which a standpipe could be placed, but they would not be quite as good as they would be a quarter to a half mile further from the center of the city.

Such a standpipe being almost in the center of the high value district could deliver an enormous quantity of water for some hours directly into the business section, as the friction loss in the mains [illegible] short length would be very small. On Diagram [illegible], we have indicated the pressures at the Water office gauge which would [illegible] maintained and also the pressure with a fire [illegible] gallons per minute, in addition to the ordinary [illegible].

A [illegible] standpipe of 7 feet would yield [illegible] gallons [illegible] reduce the pressure 3 pounds.

Such a drop would furnish 10,000 gallons per minute for an hour, and of course an equal amount could be furnished for the next hour with the loss of another 7-feet and so on. A five hour draft at this rate would draw 3,000,000 gallons and would lower the water 34 feet reducing the pressure 15 pounds but still leaving nearly 80-pounds at the City Hall.

With such a plan it would be assumed that the pumps would supply the ordinary consumption, keeping the standpipe practically full at all times, and making its capacity available for fire purposes. It would ordinarily be possible in case of a severe fire to somewhat increase the rate of pumping, thus supplying a part of the water directly, so that the standpipe would not fall as rapidly as if it were furnishing the entire draft.

Any such increase in pressure would require a change in our pumping equipment on Walnut street. The present pumps might be continued in use and the water raised from the present reservoir to the new elevation by new auxiliary pumps. If no change in pressure is made we shall, in a year or two, need a new pumping engine as the present pumps will not have sufficient reserve capacity for the probable consumption a year or two hence, and further the larger pump is nearly worn out. It would, therefore, probably be better to put in the new engine at once, if a higher pressure is adopted, making it of ten to fifteen million gallons capacity per twenty-four hours, against a pressure of about 100 pounds. For a reserve to cover times when this pumping engine would occasionally be out of service the old pumps with a booster auxiliary could be retained, but probably it would be cheaper to put in a low cost pump of simple type, good for 100 pounds pressure.

Quite likely detailed figures would show that it would be cheaper in the long run to remove the present pumps, putting a new high duty engine and a low cost pump, each of from ten to fifteen million gallons' capacity in their places. The auxiliary can be put in a separate fireproof house, and perhaps motor driven for greater safety, at but little added cost. New boilers would be necessary. As a considerable part of this will have to be done soon even if the present pressure is continued we have simply changed the plans for increasing the pressure with the difference in cost between enlarging the present equipment and putting in a new equipment for high pressure pumping.

The cost of Plan II would be approximately as follows:

Eight million gallons concrete standpipe	$125,000.00
Mains from standpipe to present large mains, about 500 feet 30-inch and 650 feet of 20-inch	10,000.00
Additional cost of high pressure pumping equipment above the cost of the additional equipment which will soon be needed in any event	40,000.00
	$175,000.00
Add 20 per cent for contingencies	35,000.00
Total	$210,000.00

Some years later a new 30-inch main will be needed from the Walnut street pumping station to City Hall square. This will require about 5,500 feet of large pipe, probably 30-inch, with a 16-inch branch to Summer street, cost, about $60,000.00. With this main the pressure could be held at nearly 90 pounds at the Water Board office through practically any fire.

Plan III—Standpipe on Pine Hill

On Pine Hill in the vicinity of the present small standpipe there is considerable area available at elevation about 212. An 8,000,000 gallon standpipe 150 feet in diameter and 60 feet deep of water could be built at this point giving a high water level of 272 feet, or 15 feet above the present low service reservoir. Such a standpipe would give a pressure at the Water office of about 100 pounds. If preferred such a standpipe could be built at a little lower level so as to give practically the same pressure as for a standpipe on High Rock, or a higher standpipe could be built giving a greater pressure.

With such a standpipe it would be necessary to lay a large new main to the center of the city so that a liberal quantity of water could be delivered in the high value district at any time. The cost of this plan would therefore be about as follows:

Eight million gallons concrete standpipe . . .	$108,000 00
A 30-inch main from standpipe to center of the city about 9,000-feet and about 600-feet of 20-inch and 500-feet of 16 inch to tie the 30-inch to existing large mains . . .	65,000 00
Additional cost of high pressure pumps the same as in Plan II	40,000 00
	$213,000 00
Additional 20 per cent. for contingencies . . .	43,000 00
Total	$256,000 00

With this standpipe a drop of water level of 4½ feet would yield about 600,000 gallons and would reduce the pressure 2 pounds. This would furnish 10,000 gallons per minute for an hour, and in the same way this draft could be maintained for two hours with a drop of 4 pounds. Five hours at this rate would lower the standpipe 22½ feet corresponding to 10 pounds which making allowance for some friction in the pipes would still give a pressure of 75 to 80 pounds at the Water office gauge. This standpipe being near the pumps could be kept full by pumping so that there need not be much lowering of pressure, except that due to the friction in the mains between the standpipe and the City Hall. — See Diagram I.

Later on as the city grows a second standpipe could be built if a larger storage capacity for water was desired.

Plan IV—Reservoir on Burrill Hill.

Burrill Hill in Lynn Woods, about 9,000 feet from our present reservoir on Pine Hill, has an elevation of about 280. A reservoir could be built on this hill of about any size desired. The high water elevation in such a reservoir could be about 230 and would give at the Water office a pressure of about 104 pounds. The larger such a distributing reservoir can be made the better fire protection it affords, for if large enough it is entirely independent of the pumping capacity during the period of any fire which could occur. Further, a large reservoir would tide the city over a number of days in case of any unusual break at the pumps. It is, therefore, simply a question of cost as to how large a reservoir can be built. A reservoir of 25,000,000 gallons capacity would be of good size, though an even larger one would be well if the cost could be taken care of.

Such a large reservoir falls very slowly so that the pressure would not vary appreciably due to the difference in elevation in the reservoir. From such a reservoir a large pipe, probably 42-inch, would be carried to Pine Hill and a new 30-inch laid from Pine Hill to the center of the city. Such pipes could deliver the largest amount of water needed for daily use and for a most severe fire with a loss of but about 15 to 20 pounds, holding the pressure at the Water office guage at 85 to 90 pounds under such heavy draft. Diagram I shows the pressure available from such a reservoir during a fire as practically the same as from a standpipe on Pine Hill. The difference would simply be that the reservoir would maintain such a draft for many hours, whereas the standpipe would lose in elevation and consequently the pressure would drop unless it was kept full by pumping.

With such a plan the Walnut street pumps would discharge directly into the large main which would run from the reservoir to the city. The water not used by the city would go back to the reservoir. The cost would be about as follows:—

Twenty-five million gallons covered Reservoir	$235,000 00
Mains from Reservoir to center of city	
About 7,300 feet 42 inches	
About 10,000 feet 30 inches	138,000 00
About 900 feet 20 inches	
About 500 feet 16 inches	
Additional cost of high pressure pumps the same as in Plans II and III	40,000 00
	$413,000 00
Additional 20 per cent. for contingencies	83,000 00
Total	$496,000 00

With Plans II, III, or IV, the present low service reservoir would be kept full standing in reserve in case of a very severe fire or in case of any accident to the pumping equipment. Thus there would always be available, in addition to the water in the standpipe or reservoir, [illegible] gallons at a sufficient elevation to give considerable service to any part of the city except the very high lands. That is, the service would be as good as it now is, and better as soon as additional new mains were laid which would bring the present reservoir water to the city with less loss of pressure.

The rate of the use of water in case of a very severe fire would probably be greater than the rate at which the proposed filter plant would be able to work. Therefore, if extra pumping were to be relied upon a supply of pure water would have to be available. Fortunately this can all be supplied from the present low service reservoir which could simply be repumped to the higher level during such emergency, the reservoir being normally kept full of good water.

Plan V — Salt Water System

A special system of fire mains supplied by pumps, probably located at the water front and taking salt water, could of course be put in. Such special pipes could be extended as far as expense would permit but would probably ordinarily not go beyond the business center where the values are highest. The pumps could possibly be set near the power houses of the Railroad Company and the Gas Company where a steam supply would always be available, or a special pumping plant, perhaps driven by oil or gas engines, could be provided. With such a system any desired pressure could of course be maintained.

We have not attempted to work out this plan in detail and have not considered [illegible] very strong protection [illegible] benefit the [illegible] valuable [illegible] in Lynn [illegible] built up, danger of conflagration such as swept the City of Chelsea about a year ago. It is desirable, therefore, if any increase of water pressure is to be made to include the whole city, thus giving every part the advantage of the better protection. Further, this plan could hardly be included in the Act as passed. It could readily be developed later and estimates made if desired.

Relative Advantages of Plans.

The comparative cost of the different plans is shown by the following table.

Plan I — Present Reservoir and new main	$60,000
Plan II — Standpipe on High Rock — At first	[illegible]
later when $60,000 has been added for a new main	[illegible]
Plan III — Standpipe on Pine Hill	[illegible]
Plan IV — Reservoir on Burrill Hill	[illegible]

Some of the advantages of the different methods are as follows:

Plan I is simple and cheap. It would materially improve present conditions and insure an ample supply for all steam fire engines which might concentrate in Lynn in case of a conflagration. It would furnish sufficient pressure for a good many fires without the use of steamers, but would not give pressure enough for severe fires and would not be good enough for the high value district without the use of the strong force of steam fire engines.

Plan II gives a large quantity of water directly into the heart of the city, so that enormous quantities could be instantly drawn at good pressure. Pumping would have to be depended upon to maintain this pressure during a long fire, and this would necessitate the new main.

Plan III accomplishes practically the same thing as Plan II, as a comparatively short line of large pipe would bring the water from the standpipe to the center of the city with very little loss of pressure. Pumping would here also have to be relied upon, but the nearness of the pumping station would make this possible from the start.

Plan IV would give about the same fire pressures as Plan III, and has the advantage over either Plan II or III of a larger supply of water always available at high level, thus being independent of the pumps for a considerable time and better able to meet any sort of an emergency or accident.

Plans II, III or IV would make it unnecessary to maintain a separate high service system as now; would thus simplify the whole distributing piping, and by consolidating it all into a single system would strengthen all parts. Any one of the three plans would give excellent fire protection.

Fire Department.

Plan II, III or IV would greatly reduce the use of steam fire engines; hose wagons with the direct hydrant pressure would be able to handle all except the most severe fires in the high buildings, and a small district on the highest land. Most of the steamers could therefore be kept largely in reserve with a few only in active service. We have consulted with Chief Harris of the Fire Department, and find that on the average in Lynn it costs about $3,400 per year more to maintain a steam fire engine in active service than to hold it in reserve. The annual cost (interest, sinking fund, care, repairs, etc.,) of the part of an engine house occupied by the steamer would be practically the same whether in active service or in reserve. In the case of new steamers, which would undoubtedly be purchased later, with the present water pressure as the city grows, but which would not be needed for many years yet with a higher pressure water supply, the annual cost of an engine house should be added and would make the total cost for maintaining a steamer about $4,200 per year.

There are now seven steamers in active service and four in reserve. After discussing the situation thoroughly with Chief Harris we find that with higher pressures as proposed in Plans II, III or IV, it would probably be sufficient to keep only four steamers in active commission, saving three steamers under present conditions. One of these is operated in connection with a chemical company and the saving would be but about $1,500 per year, so that the whole saving would be

Two steamers at	$3,400	$6,800
One steamer at	1,500	1,500
Total saving		$8,300

Chief Harris states further that it is desirable as soon as possible to put two more engine companies into commission, but that this would not be necessary with higher pressure. As this is bound to come within a short time the saving if the pressure is raised would be two steamers more of $6,800, making a total of $15,100, which could be saved yearly in Fire Department expenses by the time any high service plan could be put in commission.

The interest and sinking fund charges on any water loan are about 6 per cent., so that this saving in Fire Department cost would pay all the interest and sinking fund charges on an outlay for high pressure of $250,000.

In General.

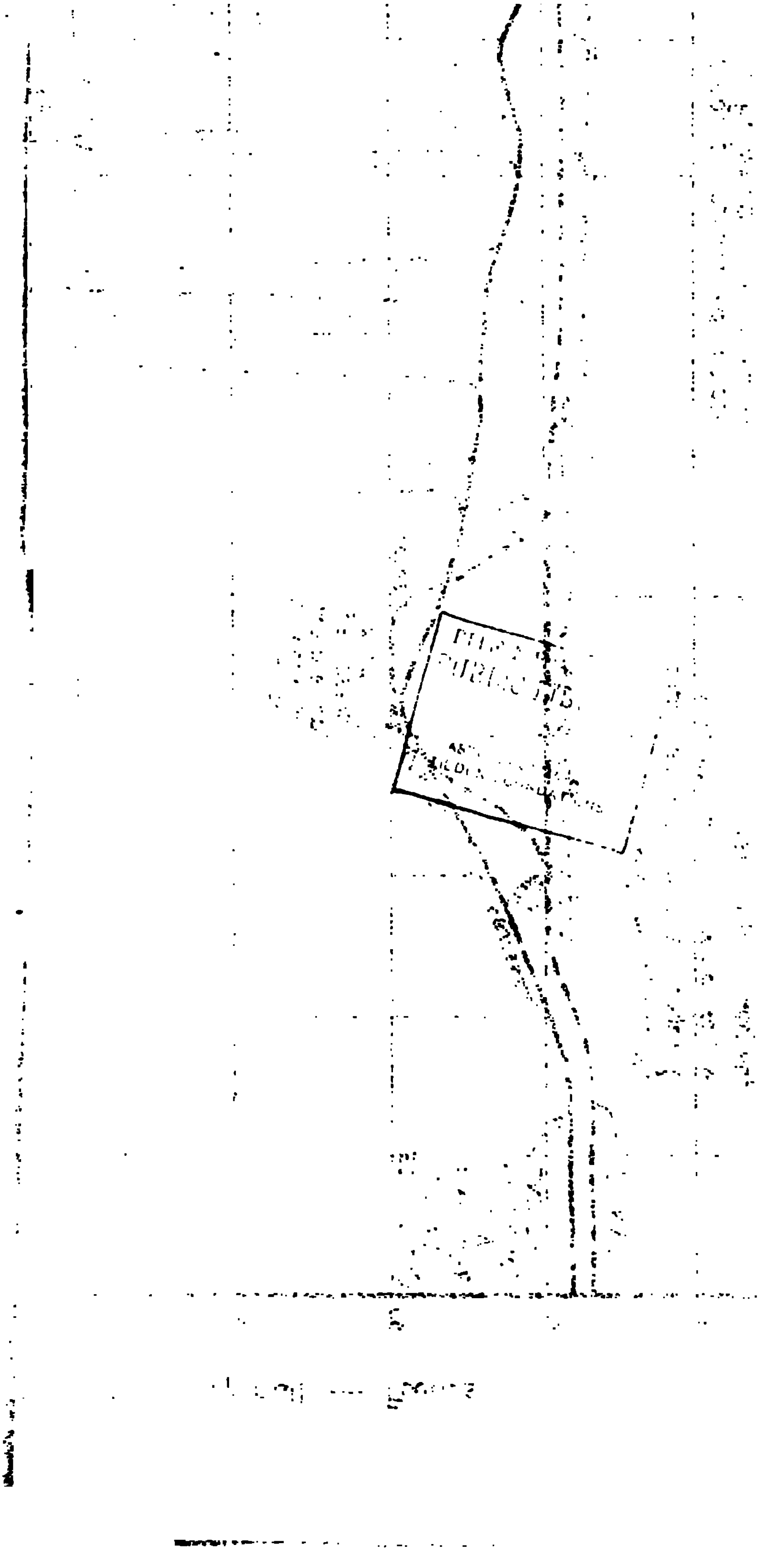
With any increase in pressure materially above 85 pounds there [illegible] increased cost for pumping water, due to the [illegible] must be lifted. This would, however, be largely offset by the higher efficiency of any new pumping [illegible] would now be provided. There would also be with a higher pressure [illegible] increase in all uses due to the added leakage [illegible] the higher pressure would cause. Experience [illegible] cities having high pressures shows that this need not be [illegible] proper care and general metering.

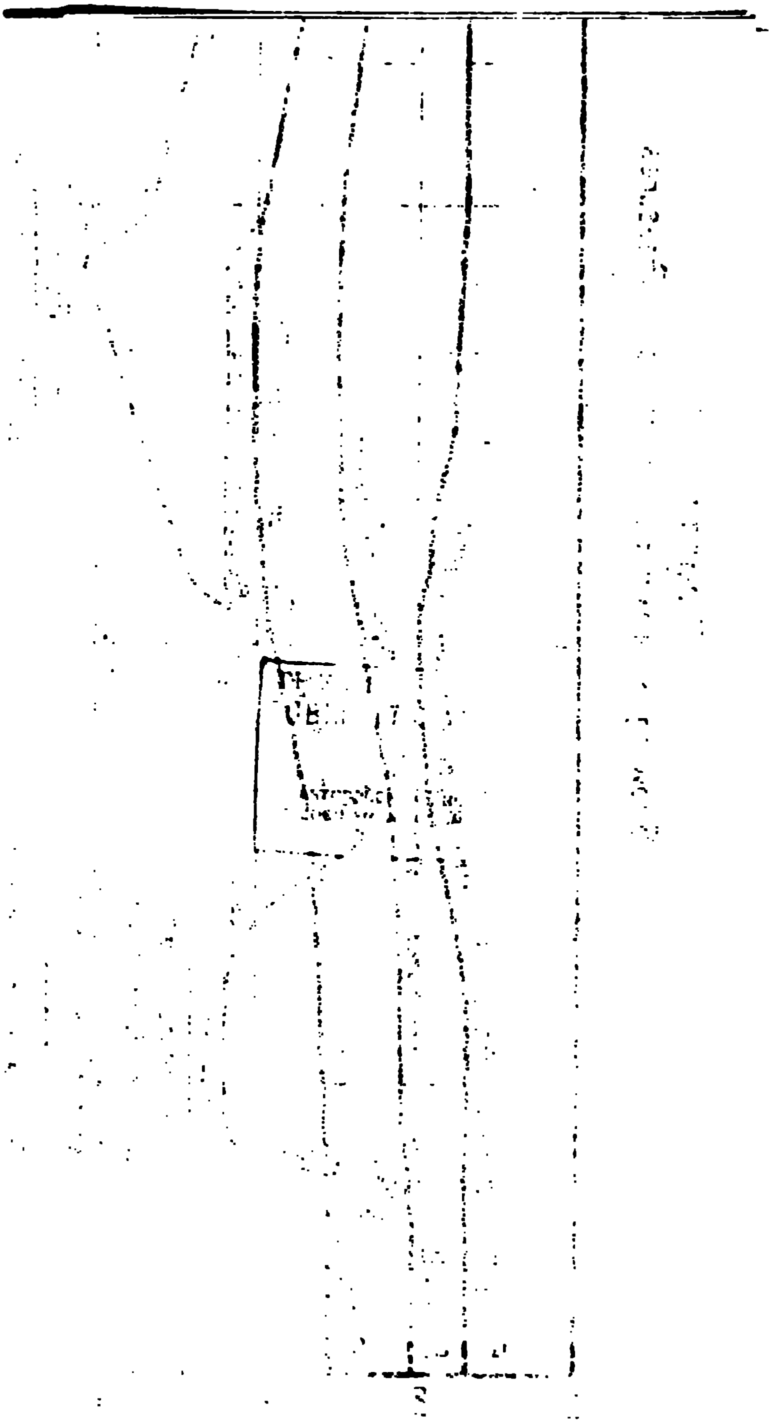
The cast iron pipe in the city is [illegible] heavy weight and would be [illegible] the pressure proposed. There is [illegible] cement pipe; it is proposed [illegible] during the present season. The remainder would have to be removed before the pressure could be increased above 65 pounds. This will have to be done in any case within a few years, and the cost of doing it will be about $75,000.

With higher pressures there would undoubtedly be some breaks at first due to weak places here and there which had not developed with the low pressure. There would be some trouble with service pipes house plumbing and hot water boilers taking city pressure directly. Alterations in plumbing would be necessary, in some cases reducing valves might have to be used for houses to some extent. For a year or two there would undoubtedly be complaints more or less constantly. However, experience in other cities indicates that after a little time and without serious cost all of the weak points would be found and corrected.

To offset these disadvantages there would be a gain throughout the city in better fire protection. No water supply and fire department can under some conditions cope with a fire in groups of poorly constructed buildings, especially if of wood and closely packed together. Only good building laws, well enforced, can ever eliminate the possibility of a sweeping conflagration. A high pressure water supply however makes every hydrant almost the equivalent of an ordinary steamer, so that an immense volume of water can be quickly concentrated in any district and a threatening fire can generally be surrounded and drowned out. The chance of a serious conflagration is therefore greatly reduced. Many of the factories in Lynn are equipped with automatic sprinklers and a high pressure makes these much more efficient and again reduces the chances of a fire gaining headway or spreading from building to building. There would therefore probably be a substantial reduction in insurance rates. Again there are general advantages from the additional uses to which higher water pressures can be put. Finally the saving probably possible in annual fire department costs would pay the interest and sinking fund charges on a large part of the first cost of any such high pressure plan.

In conclusion, therefore, the Board believes, as it has previously suggested, that a higher pressure for the city is entirely feasible and would prove in all the years to come a distinct





ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

Compliments of

The Public Water Board

LYNN, MASS.
FRANK S. WHITTEN, PRINTER
1911

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FOR THE YEAR ENDING DECEMBER 19, 1910

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OFFICERS FOR 1910.

Harry A. Swett	First Monday in April, 1915
Edward E. Pinkham	First Monday in April, 1914
Thomas Campbell, 2nd *Pres.*	First Monday in April, 1913
John J. Heys	First Monday in April, 1912
Edward V. French	First Monday in April, 1911

D. A. Sutherland, *Clerk of Board and Superintendent.*
Wallace O. Mudge, *Water Registrar.*
Charles A. Cowles, *Pumping Engineer.*
George H. Venn, *Assistant Engineer.*
Reynold H. Sutherland, *Chief Draughtsman.*
James F. Pool, *Chief Inspector.*
Horace G. Littlefield, *Foreman of Mains.*
Henry T. Wheelock, *Foreman of New Services.*
Michael J. Casey, *Foreman of Service and Main Repairs.*
Warren H. McClain, *Foreman of Meters.*
John H. Newhall, *Foreman of Water-shed.*
Reuben J. Mansir, *Foreman of Stable.*
Joseph N. Driscoll, *Storekeeper.*

Clerks.

R. Guy Northey.
Mary Marks.
Helene C. Pinkham.
L. Myrtle Hiller.

Inspectors.

William B. Moulton.
John Chamberlain.
James E. Driscoll,
Frederick E. Sprague.
Harry L. Niles.

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John H. Newhall, *Foreman of Water-shed.*
Reuben J. Mansir, *Foreman of Stable.*
Joseph N. Driscoll, *Storekeeper.*

Clerks.

R. Guy Northey.
Mary Marks.
Helene C. Pinkham.
L. Myrtle Hiller.

Inspectors.

William B. Moulton.
John Chamberlain.
James E. Driscoll,
Frederick E. Sprague.
Harry L. Niles.

ANNUAL REPORT.

To the Honorable, the Mayor and City Council:

GENTLEMEN,— The Public Water Board now submits the thirty-ninth annual report of the department, in compliance with the city charter and the ordinances.

The membership of the Board has not changed during the year, Mr. Harry A. Swett, whose term expired in March, was re-elected for another term.

Financial.

The gross income for the year has been $291,500 or about $9,500 more than for the year 1909. Again, as in recent years, a large amount of money has been spent in replacing old and weak cement pipe with cast-iron, often of larger size and renewing the connecting services as far as necessary. This year $52,000 has been spent for this work. It has been believed to be the best of policy to get out this old pipe as fast as the finances of the department would supply funds for the work. The only unusual repair work was the completing of the replacing of the broken pipe under the main dam at Waldon Pond, which was well advanced at the close of last year. The main receipts and expenditures for the year are shown in the table following:

RECEIPTS.

Meter rates	$161,868	
Fixture rates	111,349	
Miscellaneous	18,283	
		$291,500
Balance from account 1909		5,837
Overdrafts		29
		$297,366

EXPENDITURES.

Mains — Rewnewing old cement pipes with cast-iron	$42,018 00	
Extensions and ordinary repairs	10,300 00	
Services — Relaid due to renewing mains	20,857 00	
Ordinary repairs and new services	10,500 00	
Meters — New meters and repairs	8,482 00	
Salaries and office expenses	14,549 00	
Pumping Stations — Coal, supplies and repairs,	23,844 00	
Stable and Shop — Hay, grain and repairs	10,297 00	
Walden Pond Dam — Repairs	7,018 00	
Expenses — Filtration	982 00	
Ponds, etc. — Patrolling water sheds, wood cutting, care of brooks, canals, etc.	7,494 00	
		$156,341 00
Rebate to Saugus		7,670 00
Interest		64,528 00
Sinking funds		54,756 00
Balance to account 1911		12,476 00
		$195,772 00

Constant pressure was applied to collect all water rents promptly and the amounts due and unpaid on January first, 1911, were as follows:

Fixtures rates, account of 1910	$2,445 38	
Meter rates, account of 1910	3,333 90	
Construction, account of 1910	1,729 35	
Amount still due from accounts previous to 1910,	17,028 35	
Miscellaneous	801 25	
Total		$25,338 23

As this year ends the control of the Water Department by a board of five members, the receipts and expenditures which have been collected and paid by this Board during the nearly four years of its existence are given in tabulated form as a summary of what has been done and as a convenient reference for the future.

Receipts and Expenses, 1907, 1908, 1909, 1910.

	Net Receipts	Net Expenses	Interest	Sinking Funds	Surplus
1907	$290,111	$179,896	$68,215	$42,000	. . . .
1908	274,878	181,268	67,953	25,657	. . . .
1909	282,103	153,995	67,515	54,756	$5,837
1910	295,772	164,012	64,528	54,756	12,476

Sinking Funds.

All the requirements for the sinking funds for the year were met and the table given in the report of last year showing the sinking fund requirements and interest charges, due to present bond issues for some years to come, still stands, and nothing has arisen to change the general statements made in the last report regarding this matter.

Improvements and Increase of Water Supply.

The Acts of the Legislature of 1909 required Lynn to begin work on the improvement and enlargement of its water supply by January 1, 1910. A report stating progress and conditions was made December 27, 1909, to the City Council, explaining that a little more time would be necessary and promising a decision soon.

It was evident early in January that the only plan for improving the quality of the water which could then be possibly agreed upon was one providing for the construction of a mechanical filter plant, and those in the Board and in the Water Supply Committee of the Government who believed other methods better, waived their preferences and a report was adopted by the Board on January 21 and sent to the City Council, who approved it on January 21st on the recommendation of the Water Board and the Committee on Water Supply.

No long or searching study had been made at this time of this method of filtration, but it was common knowledge that there were two methods of filtration in general use, namely, slow sand and mechanical, and it was the general understandng that either method would satisfactorily handle Lynn waters. On the approval of the report by the Council it was sent to the State Board of Health, as the Legislative Act directed.

Soon after this it was brought to the attention of the Board that some troubles had occurred where mechanical filters were in use, and the water consequently continuously treated with chemicals, due to a very considerable corrosive effect which the water seemed to have on iron pipes after its filtration, and evidently in some way due to the chemical treatment. A conference was then had with the State Board of Health and this matter discussed; the State Board presenting some data showing cases where this difficulty had occurred and stating it to be their belief that with soft waters like those of Lynn there was likely to be very serious trouble and inconvenience from this cause, especially in hot water systems and perhaps in steam boilers.

No further action was taken by the Board or by the City Government, as the majority felt it best to wait for the full report of the State Board of Health, which was received on April 8th, and was as follows:

APRIL 7, 1910.

To the Public Water Board of the City of Lynn:

GENTLEMEN,—The State Board of Health received from you on January 26, 1910 a communication stating that the City Government of Lynn on January 24, 1910, approved and endorsed the recommendations of your board relative to the treatment and purification of the public water supply of the City by the installation of a mechanical filtration system.

Your report of January 21, 1910, contains the following recommendations:

"With the distinct understanding that the best chemical-mechanical plant must for safety always be under the care of a competent expert, that daily analyses must be made of the water, the best safeguards and checks against unskilled handling provided and our storage facilities utilized to their fullest extent, the following plan combing long storage and purification by chemical mechanical means is now recommended. In this plan it is proposed to not only filter all of the water but to improve the storage conditions by the installation of pumps at Montrose, on the Saugus River and at Hawkes Pond, discharging into the northern arm of Walden Pond, thus not only getting additional storage and the opportunity of taking water from Saugus River at any time but making it impossible, in any practicable way, for water to reach the filters until it has been stored for a long time.

If this general plan is approved by the council and the State Board of Health, as required by the act, detailed plans will be prepared and submitted to the Council and the State Board for final examination and approval, as the act also required."

Without plans of the work and method of treatment it is not practicable to make accurate statements of the results, but from experience and experiments made elsewhere it is probable that the cost of maintaining an efficient plant will be enough more than the cost of maintaining good slow sand filters to make the entire cost of construction and maintenance of the chemical-mechanical filters greater than that of the slow sand filter.

In the removal of color the chemical-mechanical filter has some advantage, but the result from either process with Lynn water would probably be entirely satisfacfory. In the removal of disagreeable tastes and odors a chemical-mechanical filter would not be as efficient as a slow sand filter. With such tastes and odors as have been experienced during the past year the proposed process might be satisfactory; but the increasing amount of Saugus River water to be added to the reservoirs is likely to increase the growth of organisms which produce the disagreeable tastes and odors to such an extent that mechanical filters will not remove them.

The efficiency in removal of bacteria of the best chemical-mechanical filters is not as high or as steady as of the best slow sand sand filters.

Complaints are made of excessive corrosion of iron pipes and copper tanks in which is used filtered water from well managed chemical-mechanical filters, which effect appears to be most serious with soft dark waters, like those of Lynn. This is thought to be due to the increase in carbonic acid in such waters due to filteration with coagulants.

With these results we have reason to expect active corrosion of steam boilers and water containing so much iron rust as to be very objectionable for domestic use.

We find no such general improvement in the health of the community from using the best regulated mechanical filters as when good slow sand filters have been used.

While purification by chemical-mechanical filters remain in its present experimental condition, with very objectionable results unremoved, we are unable to advise its adoption by the city of Lynn.

By order of the Board,

(Signed) MARK W. RICHARDSON,
Secretary.

This was acknowledged by the Water Board and very soon after the Committee on Water Supply of the Legislature opened hearings on the Lynn water matter and the City Government directed the City Solicitor to appear at these hearings and if possible secure the agreement of the Legislature to the plan for treating Lynn water by mechanical filtration. A number of hearings were held at which members of the Board were present but took no special part. Mr. French of the Board however stated a number of times that the objections to this method, which were not known at the time the report was adopted, seemed to be sufficient to warrant a most careful further investigation before going ahead and urged that provision for this be made.

A number of experts were secured by the City Solicitor and testified before the legislative committee. The names and present positions being as follows:

Mr. Stevenson, General Manager, Norwood Engineering Co., Florence, Mass.
Mr. Gilbert J. Pratt, Chemist, State Board of Health, Rhode Island.
Mr. Edmona S. Weston, Engineer. Boston, Mass.
Mr. Robert E. Milligan, General Manager, Continental Jewell Co , New York City, N. Y.
Mr. George W. Fuller, Engineer, Hering & Fuller, New York City, N. Y.
Chemist of Greater New York.
Chemist of The East Jersey Water Co.

Their statements were that, from their general experience with mechanical filters, they believed that this method would satisfactorily handle Lynn water. No evidence as to the possible difficulties were presented other than that furnished to the Committee by the State Board of Health acting in its official capacity as a department of the general state government.

An act was finally passed by the Legislature as follows:

[CHAPTER. 658.]

AN ACT RELATIVE TO THE WATER SUPPLY OF THE CITY OF LYNN.

Be it enacted, etc., as follows:

SECTION 1. For the purpose of establishing a filtering plant for the treatment of its public water supply and of constructing the necessary pipe lines and mains to connect the filtering plant with the sources of supply and means of distribution, the city of Lynn is hereby authorized to borrow in excess of its statutory limit of indebtedness and in addition to any amount heretofore authorized to be borrowed by said city for similar purposes, a sum not exceeding two hundred and fifty thousand dollars, and the city may from time to time issue bonds, notes or scrip therefor. Such bonds, notes or scrip shall be denominated, City of Lynn Water Loan, Act of 1910, shall be payable not more than thirty years from the dates of issue and shall bear interest at a rate not exceeding four per cent per annum, payable semi-annually, and shall be signed by the Treasurer and countersigned by the chairman of the Water Board of the city.

SECTION 2. The City Council of said city shall at the time of authorizing said loan provide for the payment thereof in such annual proportionate payments as will extinguish the same within the time prescribed in this act, and shall each year thereafter in the annual appropriation bills of the city make provision for payment out of the receipts for the use of water of such amounts of principal and interest on said loan as shall become due in the years for which said annual appropriation bills are passed. If the receipts from the water rates available for this purpose are not in any year sufficient for the payments the balance shall be raised by taxation.

SECTION 3. In order to carry out the provisions of this act the city of Lynn may take, or acquire by purchase or gift any lands, easements or rights of way necessary for the purposes. The precedure for such taking and for the assessments of damages sustained by the owners of any land or interest therein so taken shall be the same as that established by law for the taking of land by cities for sites for public schools.

SECTION 4. The city of Lynn shall begin work on said filtering plant not later than the first day of October in the year nineteen hundred and ten and shall complete the said plant with necessary connections and conduits not later than the first day of November in the year nineteen hundred and twelve. Said plant shall be of sufficient magnitude and capacity to adequately treat, purify and make safe for consumption the whole water supply of the city, and the quality of the effluent from the filtering plant shall at all times be subject to the reasonable control and approval of the State Board of Health. No act shall be done or liability incurred under this act in enlarging or improving the water supply of the city of Lynn, except in and for the making of surveys and investigations and the preparation of plans, until the plans of the proposed filtering plant connections and conduits or works have been submitted to the State Board of Health for examination and advice, which Board shall report to the said city within thirty days after the plans have been submitted to the Board.

SECTION 5. Nothing in this act shall be taken to modify or effect the duties and responsibilities pertaining to the State Board of Health under the general laws.

SECTION 6. Chapter four hundred and seventy-nine of the acts of the year nineteen hundred and seven, six hundred and ten of the acts of the year nineteen hundred and eight and four hundred and fifty-eight of the acts of the year nineteen hundred and nine are hereby repealed.

SECTION 7. This act shall take effect upon its passage. [*Approved June 15, 1910.*]

On August 4, 1910, Mr. George W. Fuller of New York, an engineer who has had much experience in the design and construction of mechanical filter plants was employed under contract with the city to make plans for a mechanical filter for Lynn, supervise the construction and also the operation of the filter after it was completed for a given time. Mr. Fuller at once began on such plans and the specifications for the work all of which were considered by the Board during the early fall and were finally worked into nearly completion.

These plans and specifications were then submitted to the State Board of Health on October 5, 1910 for their advice, as the legislative act of 1910 required. Reply was received from the State Board on November 4, 1910 advising against this method of filtration for Lynn, their report in full being as follows:

NOVEMBER 3, 1910.

To the Public Water Board of the City of Lynn:

GENTLEMEN,—The State Board of Health received on October 6th, 1910, plans and specifications of a mechanical filtration plant proposed for construction at Lynn, together with copies of the letters and communications of George W. Fuller, C. E. to the engineer and Water Board of the City of Lynn.

These communications do not indicate that the engineer, Mr. Fuller, advised the officials of Lynn that a mechanical filter plant would best serve the city in rendering the water supply satisfactory, but that he presents "a statement containing the essential features of a mechanical filter plant, for which you instructed me to prepare plans and specifications in conformity with Chapter 658 of the Acts of 1910."

These plans as outlined present the usual type of mechanical filter plant as constructed at the present time, with modifications due to this location and with the addition of the recently discovered bleaching powder treatment. They leave many details of construction apparently to the discretion of the contractor or the mechanical filter company successful in its bid for construction.

The mode of construction of the apparatus for handling and filtration, by the method decided upon by the City of Lynn, of the public water supply of the city is of much less importance in the view of this Board, at the present time, than the probable quality of the effluent from said filtering plant.

The Board concludes from its investigations and its experiments upon the Lynn water that the proposed treatment will probably fail to remove the objectionable tastes and odors arising in the Lynn water after Saugus

River and Ipswich River waters are added. The proprosed treatment is further likely to increase the growth of organisms in the open distributing reservoir and there increase the disagreeable tastes and ordors of the water distributed to consumers.

The experiments of the Board with Lynn water, treated as proposed, indicate that chemical conditions will be introduced in the water supplied to consumers that will cause corrosion of metals or increase of hardness or both, to an objectionable degree; and we find that waters treated as proposed do not cause the general improvement in the health of the community that has been experienced when good slow sand filters have been used.

The treatment proposed here is an experiment like others that have been tried, but when made with water similar to that of Lynn we know of no cases where the result has been such that we could advise the City of Lynn to depend upon it for producing a satisfactory water supply.

By order of the Board,

(Signed) MARK W. RICHARDSON,

Secretary.

The whole problem was then again considered by the Water Board and with the Committee on Water Supply of the City Council. Later a conference was arranged with the State Board of Health, and was attended by members of the Water Board, members of the Water Supply Committee and by Mr. Fuller and the State Board was asked for further reasons for the adverse advice which they had given. The whole matter was discussed and the data which the State Board had collected somewhat generally explained and more details given. The main points were that the statistics which the State Board had complied from a number of communities using mechanical filters, did not, in their judgment, show the general improvement in health which had occurred in other places where water had been passed through slow sand filters. As a health board they considered this the one vital thing and believed that the statistics did cast sufficient doubt on this method to make it decidedly inadvisable to adopt it for Lynn with the present information available.

In the second place they stated that the evidence at hand as to the probable trouble from corrosion due to the chemical treatment of the water and often, known as the "Red Water" trouble, was, they believed a real difficulty. They quoted the result of tests which they had made with Lynn water during the last few months, and stated that these showed that this difficulty could not, apparently, be sufficiently remedied, and that the additional chemicals used would surely harden the water to an undesirable extent. In short, they stated that it was their firm belief that the mechanical filtration proposed would decidedly injure Lynn water and for this reason they advised strongly against it.

Mr. Fuller contended against this position of the State Board on general grounds, giving his experience in other places, and his belief that the difficulties could be overcome, and later submitted to the Board a somewhat more detailed statement regarding the various objections which the State Board of Health had raised.

By this time the city had determined on an entire change in the form of government, under which the Water Department would be handled by one Commissioner. The Board therefore felt that it would not be proper to go further in this matter than to get all the information which had been worked upon, into the best possible shape, leaving final decision for the new commissioner and his associates. The whole matter was, however, given a good deal more study, and other possibilities considered. It was found that any plan to enter the Metropolitan system, which had been again suggested, was apparently unreasonably expensive in view of the outlays Lynn has already made in developing its own system. The general sentiment of the city is evidently strongly against filtering by the slow sand method so that the only remaining possibility was some plan for long storage. A number of methods have been considered, some conditions have changed and it seems possible that along this line a plan may be developed which will sufficiently safeguard the water for a few years to come, increase the supply, and finally form part of a complete and satisfactory system. In brief, work which with any system of purification, would eventually have to be done, can perhaps, as matters have developed, best be done first, giving some immediate relief and entailing practically no work which will not eventually be necessary.

Organization.

The organization of the department has continued to work satisfactorily and to gain in efficiency as various details have been perfected. A Buick auto truck was purchased for the construction service and when fully in commission will it is believed prove of much value and will save much time.

Meters and Water Rates.

Monthly reading of meters has been continued and prompt notice is sent whenever there is evidence of unusual consumption indicating probable leakage. As stated in the report of last year the whole question of meter rates and the purchase of meters by consumers is one which needs to be taken up and adjusted on a better basis. The pressure on the Board in connection with the improvement and enlargement of the water supply has made it impossible to take up this matter during the year.

Water Supplies for Year.

About 2,564,000,000 gallons of water were used during the year, or about 231,000,000 gallons more than for the year 1909, of this amount about 1,837,000,000 gallons came from the water shed of the four ponds and about 727,000,000 gallons from the Saugus River.

The Saugus River was let into Hawkes Pond February 10, two days later than the previous year. Pumping into Walden was stopped on April 10 with 38 feet of water 1,835,000,000 gallons, 87,000,000 gallons more than for the year 1909.

Water from Walden Pond was held in storage until June 25th thus 77 days storage were obtained, eight days less than for the year 1909. The rainfall from January 1 to June 25, 1910 was five inches less than for the corresponding time in 1909. This light rainfall caused us to draw upon Walden Pond earlier than in previous years, thereby lessening the storage time.

The amount of water in storage in the four ponds on the first of each month of the year was as follows:

	Million gallons
January 1, 1910	1,368
February 1, 1910	1,436
March 1, 1910	1,902
April 1, 1910	2,365
May 1, 1910	2,412
June 1, 1910	2,232
July 1, 1910	2,171
August 1, 1910	1,940
September 1, 1910	1,601
October 1, 1910	1,267
November 1, 1910	1,072
December 1, 1910	953
December 31, 1910	832

The Water Sheds.

Careful inspection of the water sheds has been continued during the year and every effort made to eliminate causes of pollution. This is of vital importance in safeguarding the supply especially in the case of the lower ponds, water from which may reach the consumer shortly after leaving the pond. A concrete curb was built at the lower end of Breed's Pond to keep the road wash and other possible pollution out of this pond.

The weir measurements at Montrose were continued, giving the total amount of water following down the river each month and not used by the city.

	Gallons.
January	461,840,810
February	*280,645,418
March	374,724,001
April	+212,189,170
May	125,683,088
June	174,025,525
July	39,968,441
August	18,988,752
September	13,249,840
October	232,184,212
November	14,201,021
December	12,063,300
	[illegible]

[illegible]

[illegible]

Dams, Leakage and Repairs.

Repairs on Walden Pond dam due to the breakage of the pipe under it were completed early in the year, and a gate house was later built over the controlling valves. The two pipes running under the dam were connected so that in case of the breakage of one water could be shut off and drawn through the other one.

The weirs below the dams at the several ponds were read more or less during the year and the records are given in the Superintendent's report. These showed no appreciable change overpreceding years.

Consumption.

The consumption per person per day during the year was 71.33 gallons or 1.90 gallons more than for the year 1909. This is a very reasonable consumption for a city like Lynn, and the tendency is everywhere towards a larger use of water.

Pumping Engines and Stations.

The pumping plants have given satisfactory work during the year, and have required no unusual repairs. One of the old boilders at Walnut Street Station had become badly worn out and was removed. This was replaced with a new horizontal tubular boiler, manufactured by the Robb-Mumford Co., of South Framingham, Mass. The setting of the old boiler is being changed to correspond to the new one, thus putting the steam plant into thoroughly good condition. The new boiler shows a saving of about five per cent in coal consumption. A good granolithic sidewalk was laid around the Walnut Street Station. This was entirely new for Flint street and replaced an old and poor one on Walnut street.

A change in the force mains to the reservoir and the main supply pipes to the city has been worked out with the idea of giving several ways of getting water to the city, so that no break could cut off all supply. Material has been ordered and only some delay in its delivery and other urgent work in the late fall prevented completing the change. As stated in previous reports the present consumption of the city is such that the pumping machinery at the main station on Walnut street is not in sufficien duplicate to get through a possible break down with a safe margin. It will be essential in the near future to provide additional pumping machinery. Before this can be taken up however the matter of a possible increase in pressure must be settled, as the pumps designed to best develop our present pressures would not be well adapted for a materially higher pressure.

Street Pipes.

The work done during the year in replacing old pipes, setting hydrants, etc., is shown in the following table in comparison with previous years.

	Main Pipe Laid.		Service Pipe Laid.	New Hydrants.	Hydrants Renewed.
	Miles	feet.	feet.		
1903	1	4,051	7,900	1	3
1904	4	1,116	9.957	—	—
1905	3	3.218	24,648	22	—
1906	2	4,897	24,419	15	—
1907	4	326	27,689	30	19
1908	7	1,362	36,459	72	17
1909	4	4.705	37.229	28	25
1910	5	974	36,640	40	33

There is yet in the city about 11 miles of cement pipe, which as previously stated is probably is better condition than that which had been taken out in recent years. It must all, however, be replaced in the near future and would of course all have to come out before any large increase in pressure could be made. The price of cast-iron pipe being very low the Board took the opportunity in September to buy 700 tons for later delivery.

Repair Shop.

As stated in reports for several years past the repair shop of the department is woefully inadequate to the needs of a city as large as Lynn and work has to be done under great disadvantages and at increased cost. A better shop, proper buildings for storage of supplies and yard room for the large material is very necessary.

Coal.

Coal tests have been continued during the year and the results have been good, and the coal supplied very satisfactory.

High Pressure Water.

The Board believes that an increase in the water pressure along the general lines outlined in the report of the last yeat would be of material advantage to the city, and that financially the gains both direct and indirect would justify the cost to put the Lynn system on the higher pressure and that the slight increase in annual cost of operation would be fully juftified.

In General.

The Board acknowledges with pleasure the courtesy and help generally given to its members and to all employees of the department in their performance of the various duties required of them, all of which has been helpful in the earnest endeavor to carry on a large amount of work in many directions.

Respectfully submitted,

THOMAS CAMPBELL, 2nd,
EDWARD E. PINKHAM,
HARRY A. SWETT,
E. V. FRENCH,
JOHN J. HEYS,
Public Water Board.

Treasurer's Statement.

Amount of debt, December 19, 1909	**$1,658,500 00**	
Bonds matured and paid 1910	**10,000 00**	
		$1,648,500 00

SINKING FUNDS.

Amount of funds December 19, 1910	**$449,222 26**	
Received from City Treasurer 1910	**54,756 00**	
Earnings of Funds 1910	**19,546 05**	
	$523,524 31	
Deduct bonds paid in 1910	**10,000 00**	
	$513,524 31	
Amount in hands of City Treasurer	**54,756 00**	
		$568,280 31
Total net debt		$1,080,219 69

Water Maintenance.

RECEIPTS.

Balance from account 1909	$5,837 15	
From Water Registrar	287,832 85	
From credits	2,102 38	
		$295,772 38

EXPENDITURES.

For maintenance	$164,011 88	
For interest	64,528 25	
For sinking funds	54,756 00	
		283,296 13
Balance to account, 1911		$12,476 25

ROBERT E. RAMSDELL,
City Treasurer.

REPORT OF WATER REGISTRAR.

To Thomas Campbell, 2d, President:

I herewith present the financial condition of the department for the year ending December 19, 1910.

RECEIPTS.

Meter rates, account 1910	$128,949 47	
Meter rates, account 1909	32,839 69	
Meter rates, account 1908	51 28	
Meter rates, account 1907	2 40	
Meter rates, account 1906	25 00	
		$161,867 84
Fixture rates, account 1910	$108,979 31	
Fixture rates, account 1909	1,236 45	
Fixture rates, account 1908	77 50	
Fixture rates, account 1907	12 00	
Fixture rates, account 1906	120 50	
		110,425 76
Miscellaneous, sundry sales		11,809 41
Additional, or fractional rates		2,518 14
Fines		407 40
Extra pipe, account 1910	$3,393 85	
Extra pipe, account 1909	995 78	
Extra pipe, account 1908	38 63	
Extra pipe, account 1907	34 01	
Extra pipe, account 1906	11 00	
		4,473 27
Total receipts as per cash book		$291,501 82
Balance in hands of Treasurer's, account 1909		5,837 15
Overdrafts		28 65
		$297,367 62
Less non deposit, December 17, 1910		1,595 24
Total amount, as per Treasurer's statement		$295,772 38

MAINTENANCE.

	Pay rolls	Bills	Total
Main and repairs	$23,016 83	$29,301 63	$52,318 46
Services repaired	17,948 61	13,408 96	31,357 57
Walnut Street Pumping Station .	7,476 50	12,073 98	19,550 48
Salaries and office expenses . .	11,514 75	3,034 80	14,549 55
Stable and shop	5,074 20	5,222 71	10,296 91
Meters and repairs	3,385 95	5,096 06	8,482 01
Patrolling water-sheds . . .	4,910 50	174 14	5,084 64
Walden pond dam repairs . .	3,715 42	3,302 32	7,017 74
Walden pond pumping expenses .	2,204 22	1,689 05	3,893 27
Canal and brooks	1,308 10	573 00	1,881 10
Herring & Fuller, experts . .		622 45	622 45
Filtration expenses		360 25	360 25
Saugus tax		402 64	402 64
Lynnfield tax		50 34	50 34
Damages		74 00	74 00
M. L. Quinn, repairing chimney .		400 00	400 00
	$80,555 08	$75,786 33	$156,341 41
Rebate to Saugus 50% of receipts .			7,670 47
Total			$164,011 88

EXPENSES.

Maintenance	$156,341 41	
Interest	64,528 25	
Transfer to Sinking Funds	54,756 00	
Rebate to Saugus	7,670 47	
Balance to account 1911	12,476 25	
		$295,772 38

COMPARATIVE STATEMENT.

Receipts for 1910	$291,501 82
Receipts for 1909	282,102 57
Increase	$9,399 25

Amount outstanding as per balance sheet:

Fixture rates, account 1906	$7,605 78	
Fixture rates, account 1907	243 08	
Fixture rates, account 1908	179 36	
Fixture rates, account 1909	93 50	
Fixture rates, account 1910	2,445 38	
Meter rates, account 1906	2,175 29	
Meter rates, account 1907	1,002 50	
Meter rates, account 1908	1,643 33	
Meter rates, account 1909	940 60	
Meter rates, account 1910	3,333 90	
		$19,660 72
Construction, account 1906	$2,795 87	
Construction, account 1907	98 00	
Construction, account 1908	30 20	
Construction, account 1909	222 84	
Construction, account 1910	1,729 35	
		4,876 26
Miscellaneous		801 25
Total		$25,338 23

STATEMENT.

SHOWING COST OF WORKS TO DECEMBER 19, 1910.

Mains, hydrants and gates	$883,595 30
Walden and Glen Lewis ponds	564,658 42
New supply and land	340,182 87
Services and courts	337,885 20
Engines and boilers	140,327 29
Hawkes pond	161,036 53
Reservoirs and lands	131,581 49
Birch pond and land	93,471 84
Engine house, pump and conduit, Walden pond,	83,003 72
Pipe conduits and land	81,289 39
Engine house and land	57,562 39
Breed's pond and land	57,135 28
Hawkes pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
Highland service	12,431 17
Engineering	11,157 95
Tubular wells	9,470 02
Filteration (special)	6,488 90
Workshop and stable	2,056 97
Compressor	515 00
	$3,135,148 68
Less amount received for pipe	165,122 60
Total net cost	$2,970,026 08

STATEMENT.

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED ALSO THE NUMBER OF FALMIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1910.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	13,710	1,415	15,125
Stores and shops	1,362	53	1,415
Factories	250	4	254
Offices	611	17	628
Restaurents and saloons	80	.	80
School-houses	63	14	77
Churches	34	6	40
Bakeries	30	.	30
Laundries	20	.	20
Engine-houses	12	3	15
Families	20,461	1,475	21,936
Boarding-houses	267	4	271
Faucets	36,640	2,565	39,205
Water-closets	17,485	795	18,280
Bath tubs	6,119	447	6,566
Hose bibs	3,511	250	3,761
Urinals	195	9	204
Heaters	474	94	568
Stationary engines	170	5	175
Motors	25	.	25
Green-houses	16	2	18
Drinking fountains	30	3	33
Stand-pipes for fire purposes	23	1	24
Stand-pipes for water-carts	82	.	82
Sewer connections	35	.	35
Automatic sprinklers	132	5	137
Hydrants	995	211	1,206
Hydrants for car sprinklers	44	1	45

STATEMENT.

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	**$8,989**	**00**
From January 1, 1872, to January 1, 1873	**27,568**	**15**
From January 1, 1873, to January 1, 1874	**47,992**	**61**
From January 1, 1874, to January 1, 1875	**53,545**	**61**
From January 1, 1875, to January 1, 1876	**52,553**	**26**
From January 1, 1876, to January 1, 1877	**60,807**	**12**
From January 1, 1877, to January 1, 1878	**64,002**	**50**
From January 1, 1878, to January 1, 1879	**67,570**	**14**
From January 1, 1879, to January 1, 1880	**73,949**	**80**
From January 1, 1880, to January 1, 1881	**79,635**	**12**
From January 1, 1881, to January 1, 1882	**80,967**	**76**
From January 1, 1882, to January 1, 1883	**94.419**	**52**
From January 1, 1883, to January 1, 1884	**98,893**	**54**
From January 1, 1884, to January 1, 1885	**114,903**	**86**
From January 1, 1885, to January 1, 1886	**110,089**	**11**
From January 1, 1886, to January 1, 1887	**116,573**	**70**
From January 1, 1887, to January 1, 1888	**123.507**	**73**
From January 1, 1888, to January 1, 1889	**134,480**	**77**
From January 1, 1889, to January 1, 1890	**141,865**	**53**
From January 1, 1890, to January 1, 1891	154,788	27
From January 1, 1891, to January 1, 1892	171,744	85
From January 1, 1892, to January 1, 1893	188,979	88
From January 1, 1893, to January 1, 1894	177,803	56
From January 1, 1894, to January 1, 1895	176,655	50
From January 1, 1895, to January 1, 1896	185,572	88
From January 1, 1896, to January 1, 1897	190,531	33
From January 1, 1897, to January 1, 1898	183,711	97
From January 1, 1898, to January 1, 1899	186,658	35
From January 1, 1899, to January 1, 1900	193.699	01
From January 1, 1900, to January 1, 1901	199,003	54
From January 1, 1901, to January 1, 1902	203,078	45
From January 1, 1902, to January 1, 1903	215,692	03
From January 1, 1903, to January 1, 1904	224,440	44
From January 1, 1904, to January 1, 1905	233.706	83
From January 1, 1905, to January 1, 1906	240.475	73
From January 1, 1906, to January 1, 1907	259,255	50
From January 1, 1907, to December 19, 1907	290,111	18
From December 19, 1907 to December 19, 1908	274,877	88
From December 19, 1908 to December 19, 1909	282,102	57
From December 19, 1909 to December 19, 1910	291,501	82
	$6,076,566	91

FUNDED WATER LOAN.

When Payable.		Rate Per Cent.	Amount
April	1, 1911	3½	10,000
November	1, 1913	4	20,000
November	1, 1914	3¾	31,000
March	15, 1915	4	50,000
December	1, 1914	4	20,000
December	1, 1915	3¾	6,000
April	1, 1916	3½	2,000
May	1, 1916	3½	24,500
September	1, 1916	4	10,000
October	1, 1916	4	9,000
February	1, 1917	3½	6,500
June	1, 1917	3½	3,500
July	1, 1917	4	7,500
August	1, 1917	4	5,000
October	1, 1917	4	2,000
November	1, 1917	4	6,500
April	1, 1918	4	15,000
June	1, 1918	4	10,000
July	1, 1918	4	50,000
April	1, 1919	4	100,000
July	1, 1919	4	110,000
January	1, 1920	4	35,000
April	1, 1920	4	150,000
April	1, 1921	4	50,000
October	1, 1921	4	25,000
January	1, 1922	4	50,000
July	1, 1922	4	25,000
April	1, 1923	4	40,000
July	1, 1925	4	165,000
July	1, 1926	4	50,000
September	1, 1927	4	25,000
July	1, 1928	4	25,000
October	1, 1928	4	10,000
July	1, 1929	4	25,000
January	1, 1930	4	25,000
October	1, 1930	4	25,000
July	1, 1931	3½	25,000
January	1, 1932	3½	75,000
April	1, 1932	3½	325,000
			$1,648,500

Respectfully submitted.

WALLACE O. MUDGE,

Water Registrar.

REPORT OF SUPERINTENDENT.

To the Public Water Board:

GENTLEMEN, — I herewith present the 39th Annual Report of the Superintendent for the year ending 1910. We have taken our supply of water during the year from Breed's, Birch, Hawkes and Walden Ponds and Saugus River.

A detailed statement of the transactions of the Water Department is given in the tables, diagrams, etc. following.

Water pumped and consumed.	Gallons.
Total pumped in 1910	**2,564,635,500**
Total pumped in 1909	**2,332,657,250**
Increase in pumpage in 1910	**231,978,250**
Total consumption in 1910	2,564,950,501
Total consumption in 1909	2,333,886,263
Increase in consumption	231,064,238

The average consumption at water per day in 1910 was 7,027,261 gallons showing an increase of 633,052 gallons per day more than in 1909.

The rainfall at the City Hall in 1910 was 26.19 inches, at the pumping station on Walnut street 25.01 inches. On Dec. 31, 1909, our supply of water in all ponds was 1,376,600,000 gallons, Dec. 31, 1910, our supply was 832,000,000 gallons or 544,000,000 gallons less than in 1909 this was owing to the light rainfall of 1910, it being the dryest year of any season on record.

Draughting Department.

This department has furnished plans to the foremen giving directions and stock to be used in laying the main pipe in the streets that have been laid this year. It has taken measurements of the location of all main pipe, branches, shut-offs and hydrants that have been put in during the year and drawings have been made showing the location of the pipe and fittings in the streets. There have been 1,096 measurements and diagrams made showing the location of all new and relaid services, an increase of 196 over the previous year. A number of tables, diagrams and maps have been made for the use of the Board and 3,100 stock orders have been issued to the storekeeper for stock to be used on the work done by the different departments.

Main Pipe Department.

This department has removed about four and one-half miles of cement lined pipe and relaid with cast-iron pipe generally of larger diameter to supply the increased demands. There has been 4,990 feet of pipe laid in new streets and extended. There is still remaining in the streets a number of miles of cement-lined pipe. This pipe is in fair condition and can stand the maximum pressure that can be given with our present system.

New Services.

The new service division has put in 351 services in Lynn and 110 services in Saugus, an increase of 42 over the previous year.

Services Repaired.

The repair division has renewed five hundred and twenty-six services and changed five hundred and six services from old main to new main, an increase from 1909.

It has cleaned out 2,268 services on complaint of no force.

New Meters.

The meter division has installed four hundred and twenty five new meters and replaced eighty-four old meters with new ones. It has also repaired 780 meters.

Stable.

There are three men on duty at the stable through the day and two at night. They attend to all calls for shutting off water in case of leaks, etc. A man goes to all fires when a second alarm is given to assist the fireman in case a hydrant is broken in opening or closing or a leak in the mains or fire pipes.

Storekeeper.

The storekeeper has charge of all stock, and tools, keeping a daily record of the amount on hand and reporting to the Superintendent when supplies are needed. He supplies the foreman with all necessary tools and material required for the work to be done.

D. A. SUTHERLAND,

Superintendent.

SERVICES AND REPAIRS.

New services in Lynn	351
New services in Saugus	110
Services discontinued	17
Services renewed	526
Services changed from old main to new	506
Services leaks repaired	266
Services frozen	18
Services cleaned out, no force	2,268
Services changed	10
Services extended	68
Service boxes renewed	11
Service boxes repaired and reset	124
Number of feet of lead-lined pipe used	36,640
Number of feet of galvanized pipe used	10,600
Lead connections renewed without corporations	119
New meters	425
Meters repaired	780
Meters changed	84
Meter boxes new	4
Meter boxes repaired	17
Finding and raising main gate boxes	13
Main gate boxes repaired and renewed	32
Fire hydrants new	40
Fire hydrants renewed	33
Fire hydrants repaired	63
Fire hydrants moved	9
Main gates new	37
Main gates renewed	38
Main gates repaired	4
Main pipe leaks	6

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1910.	January 19.	February 17.	March 22.	April 27.	May 23.	June 28.	July 22.	August 25.	September 22.	October 25.	December 1.	December 28.
Number of Sample . .	48203	48435	48619	48869	49056	49275	49479	49713	49892	50113	50325	5051
Plants.												
DIATOMACEÆ:												
Asterionella	7	16	0	22	215	8	24	108	0	20	10	8
Cyclotella	12	6	0	8	200	5	2	1	1	1	2	1
Meridion	0	0	2	0	0	0	0	0	0	0	0	0
Navicula	0	2	0	0	0	0	0	1	1	2	1	0
Synedra	0	2	3	7	7	2	0	1	0	2	1	0
Tabellaria	0	1	0	0	13	28	1	13	44	36	10	4
Gomphonema	0	1	0	0	0	0	0	0	0	0	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	28	78	3	3	0	0	0	0
Cœlosphærium . . .	0	0	0	0	0	0	0	0	0	1	0	0
ALGÆ:												
Raphidium	0	0	2	0	9	6	0	0	11	4	0	0
Scenedesmus	0	0	0	0	12	0	0	0	0	0	0	0
Volvox	0	0	0	0	0	1	0	0	0	0	0	0
Animals.												
FUNGI:												
Crenothrix	0	1	19	0	0	0	0	0	0	0	0	0
Zoöglœa	1	3	3	2	3	4	5	5	5	5	2	1
RHIZOPODA:												
Arcella	0	0	0	0	0	1	0	0	0	0	0	0
INFUSORIA:												
Cryptomonas	0	0	0	0	0	0	1	21	0	0	0	0
Dinobryon	8	0	12	3	0	14	0	3	47	217	2204	1200
Mallomonas	0	0	0	0	0	0	0	0	1	0	1	0
Peridinium	0	0	0	1	0	0	0	0	0	0	0	0
Synura	0	0	0	0	0	0	0	0	0	0	1	0
Glenodinium	0	1	7	0	0	13	8	0	10	0	0	0
Raphidomonas . . .	0	0	0	0	0	0	2	1	0	0	0	0
VERMES:												
Polyarthra	0	0	0	0	0	0	0	0	0	0	1	0
Synchæta	0	0	1	0	0	0	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	0	0	0	.08	0	0	0	0	.02	0	0	0
Total	28	33	49	43	487	160	46	157	120	288	2239	1214

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1910.	January 19.	February 17.	March 22.	April 27.	May 23.	June 28.	July 22.	August 25.	September 22.	October 25.	December 1.	December 28.
Number of Sample . .	48204	48436	48620	48870	49057	49276	49480	49714	49893	50114	50326	50516
Plants.												
DIATOMACEÆ:												
Asterionella	84	70	35	22	80	0	81	2	4	14	196	146
Cyclotella.	6	7	8	62	123	1472	23	233	47	39	8	6
Epithemia.	0	0	1	1	0	0	0	0	0	0	1	0
Melosira	0	0	0	0	0	0	0	0	17	36	0	0
Meridion	0	0	3	0	0	0	0	0	0	0	0	0
Navicula	0	0	0	0	0	1	0	0	2	0	0	0
Synedra	66	17	9	104	32	10	0	0	0	5	14	29
Tarbellaria	4	2	9	57	56	97	150	49	0	8	6	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	9	0	0	4	28	0	0
Cœlosphærium . . .	0	0	0	0	0	0	0	0	3	3	0	0
ALGÆ:												
Arthrodesmus . . .	0	0	0	1	3	1	1	0	0	0	0	0
Raphidium	0	0	2	2	0	3	0	5	0	0	8	0
Sphaerozosma . . .	0	0	0	0	0	0	0	3	0	0	0	0
Staurastrum	0	0	0	0	0	0	0	2	2	1	0	0
Scenedesmus	0	0	0	0	0	0	0	4	0	0	0	0
Staurogenia	0	0	0	0	0	0	0	1	0	1	0	0
Animals.												
FUNGI: Crenothrix .	0	1	9	0	0	0	0	0	0	0	0	0
FUNGI: Zoöglœa . .	1	3	5	2	3	3	3	5	10	10	6	3
INFUSORIA:												
Cryptomonas	0	43	12	0	0	0	0	0	0	1	0	0
Dinobryon	0	0	0	0	0	0	0	101	103	13	0	0
Euglena	0	0	1	0	0	0	0	0	0	0	0	0
Mallomonas.	0	0	0	0	0	0	6	0	0	0	0	0
Peridinium	2	1	0	0	0	0	0	4	0	0	0	1
Synura	0	0	1	0	0	0	0	0	0	0	0	0
Trachelomonas . . .	2	0	1	1	0	1	0	7	6	5	0	1
Vorlicella.	0	0	1	0	0	0	0	0	2	0	0	1
Chlamydomonas . .	0	0	2	0	0	0	0	0	0	0	0	0
Glenodinium	1	0	0	1	0	0	0	1	0	0	0	4
Raphidomonas . . .	0	0	0	0	0	0	0	2	6	1	0	0
VERMES:												
Anurea	0	0	0	2	0	0	0	0	0	0	0	0
Polyarthra	0	0	1	0	0	0	0	0	0	0	0	0
Rotatorian ova . . .	0	0	0	0	0	2	0	0	0	0	0	0
Nothalca	0	0	0	0	0	1	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	0	0	.02	.12	0	0	.04	0	.02	0	.04	0
Daphnia	0	0	0	0	0	0	0	0	.02	0	0	0
Diaptomus	0	0	0	0	0	0	0	0	.02	0	0	0
Total	106	145	100	162	297	1600	264	419	206	174	239	191

Microscopical Examination of Water from Quannapowitt Lake.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1909.	January 19.	February 17.	March 22.	April 27.	May 23.	June 28.	July 22.	August 25.	September 22.	October 25.	December 1.	December 28.
Number of Sample . .	48206	48438	48622	48872	49059	49278	49482	49716	49895	50116	50328	50518
Plants.												
DIATOMACEÆ:												
Cymbella	0	0	0	1	0	0	0	0	0	0	0	0
Epithemia	0	0	1	0	0	4	0	0	0	0	0	0
Navicula	0	0	0	2	0	0	1	0	1	2	0	1
Synedra	12	4	3	3	3	4	3	0	3	5	13	15
Tabellaria	0	0	4	0	0	0	0	0	0	1	1	0
Gomphonema	0	0	0	0	0	0	0	0	0	1	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	41	0	0	0	0	0	0
Clathrocystis	0	0	0	0	0	5	0	2	0	0	0	0
Cœlosphærium . . .	0	0	0	0	0	0	1	0	0	0	0	0
Oscillaria	0	0	0	0	0	1	2	1	0	0	0	2
ALGÆ:												
Botryococcus	0	0	0	0	0	2	0	0	0	0	0	0
Protococcus	0	0	0	0	0	8	10	28	0	0	0	0
Raphidium	0	0	0	0	0	3	0	0	0	0	0	0
Ophiocytium	0	0	0	0	0	0	0	0	0	0	0	0
Animals.												
FUNGI:												
Crenothrix	0	0	5	3	5	1	32	17	0	0	0	0
Zoöglœa	1	3	3	2	2	2	5	5	0	1	5	5
RHIZOPODA:												
Actinophrys	0	0	0	0	0	0	1	0	0	0	0	0
INFUSORIA:												
Ceratium	0	0	0	0	0	0	0	1	0	0	0	0
Cryptomonas	0	0	1	0	0	0	0	0	0	0	2	0
Dinobryon	74	10	3	19	0	0	0	0	0	0	0	0
Euglena	0	0	1	0	0	0	0	0	0	0	0	0
Mallomonas	0	0	1	0	0	0	0	0	0	0	0	0
Monas	0	0	0	0	0	0	1	0	0	0	2	0
Synura	2	0	11	0	0	0	0	0	0	0	1	0
Tintinnus	0	0	1	0	0	0	0	0	0	0	0	0
Trachelmonas . . .	0	0	0	0	0	0	0	0	1	0	0	0
Chlamydomonas . .	2	0	0	0	0	0	0	0	0	0	0	0
Glenodinium	15	0	0	0	0	0	0	0	0	0	5	0
VERMES:												
Anurea	1	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	.02	0	.04	0	0	0	0	0	0	0	.02	0
Total	107	17	34	36	10	71	56	54	5	10	29	23

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1910.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	227,162,686	7,327,828	1,257,044	. . .	74.45	478.31
February	197,124,786	7,040,171	919,359	. . .	71.53	459.54
March	207,393,565	6,690,113	904,679	. . .	67.97	436.09
April	199,093,396	6,636,446	900,133	. . .	67.43	433.18
May	196,773,704	5,347.539	360,575	. . .	64.49	414.33
June	201,694,218	6,723140,	42,575	. . .	68.31	438.84
July	239,147,216	7,714,426	562,988	. . .	78.38	503.55
August	229,385,472	7,399,531	489,569	. . .	75.18	482.99
September	215,357,696	7,178,589	714,802	. . .	72.94	468.57
October	218,607,394	7,051,851	395,956	. . .	71.65	460.95
November	204,378,346	6,812,611	59,514	. . .	69.22	444.08
December	228,832,022	7,381,678	990,846	. . .	75.00	481.83
Totals and averages . .	2,564,950,501	7,027,261	633,052	. . .	71.38	458.62

Basis—Population Lynn and Saugus, estimated from census of 1910, 98,420.

TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1910.

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	.07	. .	. .	. .	. .	. .	.20	. .	. .	. .
2	. .	. .	.13	. .	. .	. .	. .	. .	. .	. .	.43	. .
3	. .	*.66	. .	. .	.02	. .	. .	. .	.53	. .	.23	. .
4	. .	. .	. .	. .	. .	. .	. .	.05	.40	. .	1.19	. .
5	. .	. .	. .	. .	. .	.03	. .	. .	.54	. .	. .	. .
6	.27	. .	.39	. .	. .	.02	. .	. .	.21	. .	. .	*.05
7	1.28	. .	.14	.13	. .	. .	.03	. .	. .	.11	. .	. .
8	. .	. .	. .	.02	.05	. .	. .	. .	. .	. .	. .	. .
9	. .	.21	. .	. .	.02	.69	. .	. .	. .	.01	.29	. .
10	. .	. .	. .	. .	. .	.37	. .	.43	. .	. .	. .	. .
11	. .	.73	. .	.10	. .	1.03	. .	.02	. .	. .	. .	. .
12	. .	*.07	. .	. .	. .	.40	. .	. .	. .	. .	. .	. .
13	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
14	*.41	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15	. .	. .	. .	. .	.13	. .	. .	.10	. .	.10	. .	*.02
16	. .	. .	. .	. .	. .	.29	.22	. .	. .	. .	. .	. .
17	. .	.73	. .	. .	. .	.35	. .	. .	. .	. .	. .	. .
18	.15	. .	. .	.41	.21	.08	. .	. .	. .	. .	. .	.09
19	.12	. .	. .	.01	. .	. .	. .	.01	. .	. .	. .	.05
20	. .	. .	. .	.05	.08	. .	. .	. .	.31	. .	. .	*.10
21	.08	.50	. .	.29	.05	. .	. .	. .	. .	. .	. .	. .
22	.35	.40	. .	. .	. .	. .	. .	. .	. .	.54	.05	. .
23	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
24	. .	. .	. .	. .	. .	.05	. .	. .	. .	. .	. .	1.10
25	.40	. .	. .	.07	.10	. .	.41	. .	. .	.20	.09	. .
26	.02	. .	. .	.82	. .	. .	. .	. .	. .	. .	. .	.03
27	. .	.05	. .	. .	.07	.01	.51	. .	.16	.06	. .	. .
28	.22	69	. .	. .	. .	. .	. .	. .	. .	. .	.14	.08
29	.33	. .	. .	.07	. .	. .	. .	. .	. .	. .	.85	.07
30	.01	. .	. .	. .	.26	. .	.03	. .	. .	. .	. .	. .
31	. .	. .	.12	. .	.13	. .	. .	. .	. .	. .	. .	. .
Total	3.62	4.04	.85	1.97	1.12	4.52	1.20	.61	2.38	1.02	3.27	1.59

* Snow.

Total for the year 26.19 inches.

The above rain-fall was measured with a standard rain gauge. This gauge was formerly located on the roof of the City Hall and the results obtained were unsatisfactory due to roof structures, etc., and it was removed in 1906 to the roof of the stable on lot adjoining the City Hall grounds.

December.
*.02
*.46
*.01
*.15
*.08
*.17
*.10
*.82
*.05
.04
.06
1.96

1 the

TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1910.

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. .	. .	.07	. .	. .	. .	. .	. .	.20	. .	. .	. .
2	. .	. .	.13	. .	. .	. .	. .	. .	. .	. .	.43	. .
3	. .	*.66	. .	. .	.02	. .	. .	. .	.53	. .	.23	. .
4	. .	. .	. .	. .	. .	. .	. .	.05	.40	. .	1.19	. .
5	. .	. .	. .	. .	. .	.93	. .	. .	.54	. .	. .	. .
6	.27	. .	.39	. .	. .	.02	. .	. .	.24	. .	. .	*.05
7	1.28	. .	.14	.13	. .	. .	.03	. .	. .	.11	. .	. .
8	. .	. .	. .	.02	.05	. .	. .	. .	. .	. .	. .	. .
9	. .	.21	. .	. .	.02	.99	. .	. .	. .	.01	.29	. .
10	. .	. .	. .	. .	. .	.37	. .	.43	. .	. .	. .	. .
11	. .	.73	. .	.10	. .	1.03	. .	.02	. .	. .	. .	. .
12	. .	*.07	. .	. .	. .	.40	. .	. .	. .	. .	. .	. .
13	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
14	*.41	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15	. .	. .	. .	. .	.13	. .	. .	.10	. .	.10	. .	*.02
16	. .	. .	. .	. .	. .	.29	.22	. .	. .	. .	. .	. .
17	. .	.73	. .	. .	. .	.35	. .	. .	. .	. .	. .	. .
18	.15	. .	. .	.41	.21	.08	. .	. .	. .	. .	. .	.09
19	.12	. .	. .	.01	. .	. .	. .	.01	. .	. .	. .	.05
20	. .	. .	. .	.05	.08	. .	. .	. .	.31	. .	. .	*.10
21	.08	.50	. .	.29	.05	. .	. .	. .	. .	. .	. .	. .
22	.35	.40	. .	. .	. .	. .	. .	. .	. .	.54	.05	. .
23	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
24	. .	. .	. .	. .	. .	.05	. .	. .	. .	. .	. .	1.10
25	.40	. .	. .	.07	.10	. .	.41	. .	. .	.20	.09	. .
26	.02	. .	. .	.82	. .	. .	. .	. .	. .	. .	. .	.03
27	. .	.05	. .	. .	.07	.01	.51	. .	.16	.06	. .	. .
28	.22	.60	. .	. .	. .	. .	. .	. .	. .	. .	.14	.08
29	.33	. .	. .	.07	. .	. .	. .	. .	. .	. .	.85	.07
30	.01	. .	. .	. .	.26	. .	.03	. .	. .	. .	. .	. .
31	. .	. .	.12	. .	.13	. .	. .	. .	. .	. .	. .	. .
Total	[illegible]	[illegible]	.85	1.97	1.12	4.52	1.20	.61	2.38	1.02	3.27	1.59

* Snow.

Total for the year 26.19 inches.

The above rain-fall was measured with a standard rain gauge. This gauge was formerly located on the roof of the City Hall and the results obtained were unsatisfactory due to roof structures, etc., and it was removed in 1909 to the roof of the stable on lot adjoining the City Hall grounds.

December.
.02
.40
.01
.15
.08
.17
.10
.82
.05
.04
.06
1.90

the

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2
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13
14

To

TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1910

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 . .	. .	. .	.05	. .	. .	. .	. .	. .	.12	. .	. .	*.02
2 . .	. .	. .	.13	. .	. .	. .	. .	. .	. .	. .	.32	. .
3 . .	*.02	*.56	. .	. .	.03	.02	. .	. .	.47	. .	.12	. .
4 . .	. .	*.05	. .	. .	. .	. .	. .	.09	.35	. .	.35	. .
5 . .	.25	. .	. .	. .	.04	.49	. .	. .	.38	. .	.05	. .
6 . .	1.12	. .	.35	. .	. .	.10	. .	. .	.18	. .	. .	*.46
7 . .	. .	. .	.17	.08	.05	. .	.03	. .	. .	.12	. .	. .
8 . .	. .	. .	. .	.05	.03	.	. .	. .	. .	. .	. .	. .
9 . .	*.09	.16	. .	. .	. .	.92	. .	. .	. .	.04	.27	. .
10 . .	. .	. .	. .	. .	. .	.17	. .	.23	. .	. .	.03	. .
11 . .	. .	.*81	. .	.09	. .	.70	. .	.03	. .	. .	. .	*.01
12 . .	. .	.10	. .	. .	. .	.33	. .	. .	. .	. .	. .	. .
13 . .	. .	. .	.06	. .	. .	. .	.01	. .	. .	. .	*.01	. .
14 . .	*.82	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15 . .	*.07	. .	. .	. .	.21	. .	. .	.05	. .	.12	. .	*.15
16 . .	. .	.06	. .	. .	. .	.30	.23	. .	. .	. .	. .	. .
17 . .	.10	.72	*.02	.02	. .	.29	. .	. .	. .	. .	. .	. .
18 . .	.12	. .	. .	.33	.20	.15	. .	.52	. .	. .	. .	*.08
19 . .	. .	. .	. .	.03	. .	. .	. .	. .	.02	. .	. .	. .
20 . .	. .	. .	.03	.02	.08	. .	. .	. .	.28	. .	. .	*.17
21 . .	.08	.39	. .	.32	.09	. .	. .	. .	. .	. .	. .	*.10
22 . .	.25	*.37	. .	.04	. .	. .	. .	. .	. .	.41	.08	. .
23 . .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
24 . .	. .	. .	. .	. .	. .	.10	. .	. .	.05	. .	. .	*.82
25 . .	*.52	. .	. .	.07	.07	. .	.52	. .	. .	.17	.09	. .
26 . .	*.07	. .	. .	.53	. .	. .	. .	. .	. .	. .	. .	*.05
27 . .	. .	.08	. .	. .	.02	.04	.55	. .	.20	.12	. .	. .
28 . .	*.21	.58	. .	. .	. .	. .	. .	. .	.01	. .	.10	.04
29 . .	.25	. .	. .	.07	. .	. .	.12	. .	. .	. .	.85	.06
30 . .	*.02	. .	. .	. .	.23	. .	. .	. .	. .	. .	. .	. .
31 . .	. .	. .	.12	. .	.19	. .	. .	. .	. .	. .	. .	. .
Total	3.99	3.88	.93	1.65	1.24	3.67	1.46	.92	2.06	.98	2.27	1.96

*Snow.

Total for the year, 25.01 inches.

The above rain-fall was measured by a standard gauge. This gauge is located in the rear of Pumping Station on vacant lot.

TABLE IV.

G THE AVERAGE DEPTH OF THE WATER IN PONDS FOR EACH WEEK DURING 1910.

WEEK ENDING	FEET.							
	Breed's Pond.		Birch Pond.		Walden Pond.		Hawkes Pond.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
January 1	18	11	16	5	20	7	25	10
January 8	18	6	15	5	20	11	25	11
January 15	18	6	14	6	21	4	26	0
January 22	18	5	14	2	21	6	26	0
January 29	19	5	17	10	20	5	26	1
February 5	20	8	21	2	18	10	26	1
February 12	20	11	22	0	19	9	24	0
February 19	20	8	21	2	22	5	22	9
February 26	20	6	20	9	24	11	23	0
March 5	20	6	20	9	27	9	23	8
March 12	20	6	20	10	30	4	24	4
March 19	19	11	20	8	32	2	23	10
March 26	19	1	20	2	34	0	23	2
April 2	18	2	19	7	35	7	22	6
April 9	17	2	19	0	37	2	21	3
April 16	16	3	18	4	38	0	21	4
April 23	15	4	17	6	38	0	22	4
April 30	14	7	16	10	38	1	22	9
May 7	13	9	16	1	38	0	22	11
May 14	12	10	15	3	38	0	23	0
May 21	11	10	14	5	37	11	22	11
May 28	10	9	13	6	37	10	23	0
June 4	9	8	12	7	37	10	22	11
June 11	8	5	11	9	37	10	23	0
June 18	8	4	10	10	38	1	23	8
June 25	8	11	9	3	38	4	24	6
July 2	9	0	10	9	37	5	24	7
July 9	9	0	14	1	35	8	24	5
July 16	9	7	16	11	33	10	24	2
July 23	10	8	19	0	31	11	23	11
July 30	11	9	20	0	30	7	23	8
August 6	12	9	19	5	29	9	23	5
August 13	13	5	19	6	28	8	23	3
August 20	14	1	19	4	27	9	23	0
August 27	14	7	19	5	26	9	22	9
September 3	14	9	19	9	25	8	22	6
September 10	14	9	19	9	25	0	22	4
September 17	14	8	19	7	24	4	22	3
September 24	14	8	19	4	23	7	22	2
October 1	14	7	19	6	22	9	22	0
October 8	14	0	19	7	21	9	21	10
October 15	14	6	19	8	20	9	21	8
October 22	14	5	19	10	19	10	21	5
October 29	14	7	19	10	18	11	21	4
November 5	15	2	19	9	18	1	21	5
November 12	15	10	19	8	17	3	21	8
November 19	16	3	19	4	16	5	21	8
November 26	16	7	18	11	15	8	21	7
December 3	16	9	18	9	14	11	21	8
December 10	17	0	19	0	13	11	21	10
December 17	17	1	18	11	12	9	21	9
December 24	17	1	18	9	11	9	21	9
December 31	17	4	19	1	10	10	22	3

TABLE V.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE.

KIND.	⅝-in.	¾-in.	1-in.	1½-in.	2-in.	3-in.	4-in.	Total
Lambert	1,485	1,705	244	47	48	...	1	3,530
Trident	747	795	94	4	1	...	...	1,641
Worthington	284	199	30	4	9	...	...	526
Thompson	33	103	26	4	...	1	...	167
Hersey	76	65	11	...	...	...	...	152
Nash	45	13	1	...	1	...	...	60
Union	2	13	...	6	5	...	8	34
Niagara	19	13	1	...	...	...	...	33
Empire	11	9	4	4	2	1	1	32
Ball and Fitts	9	7	9	...	...	...	...	25
Columbia	22	...	...	...	...	...	...	22
Crown	1	5	...	...	...	...	...	6
King	2	...	...	...	...	...	...	2
All others	4	...	1	2	...	2	...	9
Total	2,740	2,927	421	71	66	4	10	6,239

TABLE VI.

COURT PIPES LAID IN 1910.

	Size and Length.			
	1¼ in.	1½ in.	2 in.	Total
eacon Hill avenue	..	..	159	159
Blaisdell terrace	..	166	..	166
9 Boulevard	..	89	112	201
*Chancery court	..	..	194	194
216 Chestnut	..	..	220	220
Den Quarry road	..	..	467	467
*Fayette street	..	..	217	217
*Foster	147	..	..	147
Greenleaf Circle	..	..	173	173
Hillside avenue	..	..	88	88
†Hoag's court	..	..	25	25
Laighton court	..	..	306	306
*Lee court	..	..	276	276
*Libby court	..	36	132	168
†Magnolia avenue	..	..	209	209
Nash terrace	..	..	123	123
†Newton avenue	..	..	165	165
161 North Common	..	..	325	325
Noyes terrace	..	..	118	118
Pine Grove Cemetery	..	..	191	191
*Sachem terrace	..	..	253	253
*Silsbee-street court	..	90	75	165
24 Shepard	185	..	..	185
47 Shepard	..	75	76	151
Tower avenue	..	..	73	73
†Waitt avenue	..	..	273	273
Total	332	456	4,250	5,038

*Relaid. †Extended.

TABLE VII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1910.

STREET.	FROM	TO	Taken out	Size Inches and Length Feet						
				4	6	8	10	12	16	Total.
Allen av.† .	. . . . .	. . . . . .	. .	. .	60	.	. .	. .	. .	60
Alley	Blossom . .	Pleasant . .	4	. .	. .	1,066	. .	. .	. .	1,066
Astor	Neptune . .	Summer . .	4	. .	517	. .	. .	. .	. .	517
Atkinson* . .	Walnut . .	Linwood . .	2	. .	627	. .	. .	. .	. .	627
Autumn* . .	Bloomfield .	Lewis . . .	4	. .	920	. .	. .	. .	. .	920
Bay State rd.‡	Broadway .	. . . . .	. .	. .	. .	809	. .	. .	. .	809
Bennett‡ . .	Oakville . .	Orchard . .	. .	. .	150	100	. .	. .	. .	250
Blake‡ . . .	Buffum . .	Mulberry . .	. .	. .	. .	241	. .	. .	. .	241
Camden . .	Cooper . . .	. . . . .	6	. .	1,030	. .	. .	. .	. .	1,030
Cedar	Walnut . .	Salem . . .	6	. .	253	. .	. .	. .	. .	253
Chatham . .	Parrott . . .	R. R. bridge	6	. .	. .	. .	. .	. .	252	252
Commercial .	Sea St. Ex.	Charles . . .	8	. .	. .	. .	. .	700	. .	700
Deer Cove* .	Lynn Sh. dr.	Ocean . . .	2	. .	454	. .	. .	. .	. .	454
Eastern av.†	Erie	. . . . .	. .	. .	. .	. .	20	. .	. .	20
Fair Oaks av*	Lynnfield .	Sluice rd. .	2	. .	768	. .	. .	. .	. .	768
Fairview‡ . .	Verona . .	. . . . .	. .	. .	190	. .	. .	. .	. .	190
Fortesque tr.‡	Chestnut . .	. . . . .	. .	214	. .	. .	. .	. .	. .	214
Graves av.* .	Goodridge .	Western av.	2	. .	870	. .	. .	. .	. .	870
Greenw'd rd.‡	Bay State rd.	. . . . .	. .	. .	472	. .	. .	. .	. .	472
High Rock .	Herbert . .	Valley av. .	6	. .	826	. .	. .	. .	. .	826
Kernwood rd‡	Sluice rd. .	. . . . .	. .	. .	200	. .	. .	. .	. .	200
Kimball rd.‡	Lynn Sh. dr.	. . . . .	. .	. .	186	. .	. .	. .	. .	186
King*	Lynn Sh. dr.	Ocean . . .	4	. .	473	. .	. .	. .	. .	473
Kirtland* . .	Boston . . .	Walnut .	12	. .	. .	1,213	. .	. .	. .	1,213
Linwood† . .	Ontario . .	. . . . .	. .	. .	400	. .	. .	. .	. .	400
Lynnfield . .	Wyoma sq.	Gr. Wds. rd.	. .	. .	. .	. .	. .	3,736	. .	3,736
Maple	Euclid av. .	Brooklawn	6	. .	. .	429	. .	. .	. .	429
Marion . . .	Centre . . .	Brookvale .	2	. .	315	. .	. .	. .	. .	315
Michigan av*	Superior . .	Ocean . . .	4	. .	1,230	. .	. .	. .	. .	1,236
New Ocean .	Michigan av.	Eastern av.	1½	. .	490	. .	. .	. .	. .	490
Oneida . . .	New Ocean	. . . . .	1½	. .	232	. .	. .	. .	. .	232
Orchard . . .	Bennett . .	W. Neptune	6	. .	. .	741	. .	. .	. .	741
Porter* . . .	Essex . . .	Ingalls . . .	4	. .	631	. .	. .	. .	. .	631
River	Cooper . . .	River-st. ct.	6	. .	900	. .	. .	. .	. .	900
Robinson . .	Walnut . .	. . . . .	6	. .	45	. .	. .	. .	. .	45
Salem	Cedar . . .	Grove . . .	6	. .	162	. .	. .	. .	. .	162
Saunders rd.‡	Gre'n Wd. rd	. . . . .	. .	. .	64	. .	. .	. .	. .	64
School . . .	Smith . . .	. . . . .	4	. .	. .	200	. .	. .	. .	200
Sewell* . . .	Jackson . .	Eastern av.	4	. .	. .	838	. .	. .	. .	838
Sluice rd.* .	Fair Oaks av	End	2	. .	374	. .	. .	. .	. .	374
Smith* . . .	Union . . .	End	4	. .	. .	581	. .	. .	. .	581
Spruce† . . .	End of pipe	. . . . .	. .	. .	60	. .	. .	. .	. .	60
Stone pl.* . .	Lewis . . .	End	1½	356	. .	. .	. .	. .	. .	356
Sweetser ter.‡	Broadway .	End	. .	432	. .	. .	. .	. .	. .	432
Trevett ave.‡	Lynnfield .	. . . . .	. .	. .	852	. .	. .	. .	. .	852
Washington	Laighton . .	Boston . . .	12	. .	. .	1,375	. .	. .	. .	1,375
West* . . .	Charles . . .	Stickney . .	4	. .	230	. .	. .	. .	. .	230
Western av. .	Chestnut . .	Maple . . .	10	. .	. .	. .	. .	. .	1,580	1,580
W. Neptune*	Pitkin . . .	Oakville . .	4	. .	. .	1,700	. .	. .	. .	1,700
Winthrop† .	End of pipe	. . . . .	. .	. .	360	. .	. .	. .	. .	360
Wo'db'ry av.†	End of pipe	. . . . .	. .	. .	180	. .	. .	. .	. .	180
*Whole street relaid. †Pipe extended. ‡New.				1,002	14,527	9,293	20	4,436	1,832	31,110

	MILES.	FEET.
Total length relaid	4	1,264
Total length extended		1,080
Total length new		3,910
Total length of system—Lynn, Saugus and Swampscott	144	3,623
Total length in Swampscott		1,788
Total length in Saugus	24	1,802

TABLE VIII.

SHOWING THE TOTAL LENGTH IN FEET AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1910.

	6-in.	2-in.	1½-in.	1¼-in.	1-in.	¾-in.	Total
Lynn	186	2,329	511	2,653	8,484	4,632	18,795
Saugus	. .	75	. .	129	2,634	2,743	5,581
Total	186	2,404	511	2,782	11,118	7,375	24,376

TABLE IX.

SHOWING THE LOCATION AND SIZE OF GATES SET IN 1910.

STREET.	LOCATION.
Alley	8-inch gate. 6 inches west of the east line of Blossom street, 16 feet 2 inches north of the south side of Alley street.
Alley	8-inch gate. On the line of the west side of Pleasant street, 16 feet 1 inch north of the south side of Alley street.
Astor.	6-inch gate. 1 foot 6 inches north of the north line of Neptune street, 10 feet 10 inches west of the east side of Astor street.
Astor	6-inch gate. On the line of the south side of Summer street, 11 feet 5 inches west of the east side of Astor street.
Atkinson..	6-inch gate. 9 feet 5 inches north of north side of Walnut street, 19 feet 3 inches west of the east side of Atkinson street.
Atkinson.	6-inch gate. On the line of the west side of Linwood street, 14 feet 1 inch south of the north side of Atkinson street.
Autumn	6-inch gate. 6 inches north of the south line of Bloomfield street, 16 feet 6 inches east of the west side of Autumn street.
Autumn	6-inch gate. On the line of the north side of Lewis street, 12 feet 2 inches east of the west side of Autumn street.
Bay State road . .	8-inch gate. On the line of the north side of Broadway, 18 feet 2 inches east of the west side of Bay State road.
Beacon Hill avenue	2-inch valve. On the line of the east side of Rock avenue, 25 feet south of the north side of Beacon Hill avenue.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Bennett	**8-inch gate. On the line of west side of Commercial street, 32 feet north of the south side of Bennett street.**
Blaisdell terrace . .	**1½-inch valve. On the line of the south side of Lewis street, 7 feet west of the east side of Blaisdell terrace.**
Blake	**8-inch gate. On the line of the west side of Buffum street, 16 feet north of the south side of Blake street.**
Blake	**8-inch gate. On the line of the east side of Mulberry street, 14 feet north of the south side of Blake street.**
Broad	**10-inch gate. 1 foot 3 inches west of the east line of Portland street, 17 feet 3 inches north of the south side of Broad street.**
Brooklawn terrace.	**6-inch gate. On the line of the south side of Maple street, 16 feet 8 inches east of the west side of Brooklawn terrace.**
Brooklawn terrace.	6-inch gate. On the line of the north side of Western avenue, 16 feet 2 inches east of the west side of Brooklawn terrace.
Chatham	16-inch gate. 6 inches north of the north side of Parrott street, 17 feet east of the west side of Chatham street.
Cleveland	6-inch gate. On the line of the north side of Western avenue, 24 feet 9 inches west of the east side of Cleveland street.
Commercial . . .	12 inch gate. 3 feet 10 inches north of the north line of Sea street Extention 16 feet west of the east side of Commercial street.
Dennison avenue .	4-inch gate. On the line of the north side of Maple street, 10 feet east of the west side of Dennison avenue.
Deer cove	6-inch gate. On the line of the south side of Ocean street, 12 feet 4 inches west of the east side of Deer Cove.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Empire	6-inch gate. On the line of the south side of Sewell street, 16 feet 8 inches east of the west side of Empire street.
Fair Oaks avenue .	6-inch gate. On the line of the south side of Lynnfield street, 20 feet 2 inches east of the west side of Fair Oakes avenue.
Fairview avenue .	6-inch gate. On the line of the east side of Verona street, 16 feet south of the north side of Fairview avenue.
Fayette	2-inch valve. On the line of the south side of Marianna street, 14 feet 6 inches west of the east side of Fayette street.
Fortesque terrace .	4-inch gate. On the line of the west side of Chestnut street, 7 feet 10 inches south of the north side of Fortesque terrace.
Groves avenue . .	6-inch gate. On the line of the north side of Goodridge street, 17 feet 5 inches west of the east side of Graves avenue.
Greenleaf circle .	2-inch valve. On the line of the east side of Nahant street, 5 feet north of the south side of Greenleaf Circle.
Greenwood road .	6-inch gate. On the line of the west side of Bay State road, 16 feet 2 inches south of the north side of Greenwood road.
Greenwood road .	6-inch gate. On the line of the west side of Saunders road, 13 feet 4 inches north of the south side of Greenwood road.
Hillside avenue .	2-inch valve. On a line with the dividing line between No. 72 and No. 68, 28 feet 7 inches east of the west side of Hillside avenue.
Houghton	4-inch gate. On the line of the west side of Orchard street, 17 feet 2 inches south of the north side of Houghton street.
Jefferson	6-inch gate. On a line with the west side of Sheridan street, 19 feet north of the south side of Jefferson street.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Kernwood road	**6-inch gate. On the line of the south side of Sluice road, 11 feet 5 inches west of the east side of Kernwood road.**
Kimball road	**6-inch gate. On the line of the north side of Lynn Shore Drive, 15 feet 8 inches west of the east side of Kimball road.**
King	**6-inch gate. On the line of the south side of Ocean street, 14 feet 8 inches west of the east side of King street.**
Kirtland	**8-inch gate. 16 feet 7 inches north of the south line of Walnut street, 16 feet 1 inch west of the east line of Kirtland street.**
Laighton court	**2-inch valve. On the line of the north side of Laighton street, 6 feet east of the west side of Laighton court.**
Lee court	2-inch valve. 6-inches east of the east line of Chatham street, 19 feet 1 inch north of the south side of Lee court.
Lewis	10-inch gate. On the line of the east side of Atlantic street, 12 feet 6 inches north of the south side of Lewis street.
Light street	10-inch gate. On the line of the north side of West Neptune street, 19 feet 6 inches east of the west side of Light street.
Linwood	6-inch gate. On the line of the east side of the square formed by the intersection of Linwood street and Ontario street, 33 feet 7 inches north of the south side of Linwood street.
Lynnfield	12-inch gate. On the line of the south side of Auburn street, 17 feet, 5 inches west of the east side of Lynnfield street.
Lynnfield	12-inch gate. On the line of the south side of the square formed by the intersection Bacheller street and Lynnfield street, 15 feet 2 inches west of the east side of Lynnfield street.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Magnolia avenue .	2-inch valve. On a line with the north side of stable at No. 39 Magnolia avenue, 16 feet east of the west side of Magnolia avenue.
Maple	8-inch gate. On the line of the east side of Euclid avenue, 13 feet 3 inches north of the south side of Maple street.
Marion	6-inch gate. 15 feet 4 inches west of the east side of Centre street, 27 feet 4 inches from the south east corner of Marion and Centre streets.
Michigan avenue .	6-inch gate. On a line with the south side of Superior street, 17 feet 11 inches west of the east side of Michigan avenue.
Michigan avenue .	6-inch gate. On a line with the north side of Seymour avenue, 17 feet 2 inches west of the east side of Michigan avenue.
Michigan avenue .	6-inch gate. On the line of the north side of Ocean street, 11 feet 4 inches west of the east side of Michigan avenue.
Minot	6-inch gate. On the line of the north side of West Neptune street, 16 feet 11 inches east of the west side of Minot street.
Nash terrace . . .	2-inch valve. On the line of the south side of Boston street, 2 feet 9 inches west of the east side of Nash terrace.
New Ocean.	6-inch gate. On a line with the east side of Michigan avenue, 14 feet 6 inches south of the north side of New Ocean street.
Newton avenue. . .	2-inch valve. On a line with the north side of house No. 15, 49 feet 4 inches east of east side of house No. 15.
Lovejoy place. . .	2-inch valve. 10 feet south of the north side of North Common street, 7 feet west of the east side of Lovejoy place.
Noyes terrace. . .	2-inch valve. On the line of the north side of Sewell street, 11 feet 2 inches east of the west side of Noyes terrace.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Oakville	6-inch gate. 1 foot 4 inches south of the north side of Bennett street, 32 feet 10 inches east of the west side of Oakville street.
Oakville	6-inch gate. On the line of the south side of Summer street, 17 feet 2 inches west of the east side of Oakville street.
Oneida.	6-inch gate. On the line of the north side of New Ocean street, 14 feet 10 inches west of the east side of Oneida street.
Orchard	8-inch gate. 1 foot 6 inches south of the north side of Bennett street, 17 feet 5 inches west of the east side of Orchard street.
Porter	6-inch gate. On the line of the south side of Ingalls street, 16 feet 4 inches east of the west side of Porter street.
Robinson	6-inch gate. On the line of the south side of Walnut street, 27 feet west of the east side of Robinson street.
Rockingham . . .	6-inch gate. On the line of the south side of Western avenue, 20 feet 3 inches west of the east side of Rockingham street.
Sachem terrace . .	2-inch valve. On the line of the east side of Sachem street, 13 feet 4 inches north of the south side of Sachem terrace.
Salem	6-inch gate. On the line of the west side of Grove street, 34 feet north of the south side of Salem street.
School	8-inch gate. On the line of the east side of School street, 14 feet 9 inches south of the north side of School street.
Sewell	8-inch gate. On the line of the west side of Eastern avenue, 17 feet south of the north side of Sewell street.
Silsbee-street court	2-inch valve. On the line of the west side of Silsbee street, 8 feet 4 inches south of the south side of House No. 59.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Court 24 Shepard	1½-inch valve. On the line of the east side of Shepard street, 5 feet 3 inches north of the south side of Court.
Court 47 Shepard	2-inch valve. On the line of the west side of Shepard street, 12 feet 1 inch north of the south side of Court.
Sluice road	6-inch gate. On the line of the south side of Fair Oaks avenue, 16 feet 7 inches east of the west side of Sluice road.
Smith	8-inch gate. On the line of the south side of Union street, 19 feet 10 inches west of the east side of Smith street.
Stickney	4-inch gate. On the line of the west side of Vine street, 36 feet south of the north side of Stickney street.
Sweetser terrace	4-inch gate. On the line of the east side of Broadway, 9 feet 6 inches south of the north side of Sweetser terrace.
Trevett avenue	6-inch gate. 4 feet 3 inches west of the west side of Lynnfield street, 20 feet 6 inches north of the south side of Trevett avenue.
Tower avenue	2-inch valve. 2 feet west of the east side of Safford street, 13 feet 7 inches south of the north side of Tower avenue.
Waitt avenue	2-inch valve. On a line with the east side of house No. 78, 14 feet south of the north side of Waitt avenue.
Washington	8-inch gate. 2 feet northwest of the northwest side of Laighton street, 15 feet 9 inches northeast of the southwest side of Washington street.
Washington	8-inch gate. 7 inches northwest of the southwest side of Western avenue, 15 feet 5 inches northeast of the southwest side of Washington street.
Washington	8-inch gate. On a line with the northwest side of Western avenue. 16 feet 10 inches northeast of the southwest side of Washington street.

TABLE IX.—*Continued.*

STREET.	LOCATION.
Washington . . .	8-inch gate. On the line of the southeast side of Boston street, 34 feet 1 inch southwest of the northwest side of Washington street.
West	6-inch gate. On the line of the north side of Charles street, 13 feet 4 inches west of the east side of West street.
West	6-inch gate. On the line of the south side of Stickney street, 15 feet 9 inches west of the east side of West street.
Western avenue .	16-inch gate. 6 inches northeast of the southwest side of Chestnut street, 16 feet 3 inches southeast of the northwest side of Western avenue.
Western avenue .	16-inch gate. 1 foot southwest of the southwest side of Cleveland street, 17 feet 6 inches southeast of the northwest side of Western avenue.
West Neptune . .	8-inch gate. On the line of the west side of Light street, 15 feet south of the north side of West Neptune street.
West Neptune . .	8-inch gate. On the line of the east side of Light street, 16 feet 9 inches south of the north side of West Neptune street.
West Neptune . .	8-inch gate. On the line of the west side of Oakville street, 16 feet 2 inches south of the north side of West Neptune street.

TABLE X.

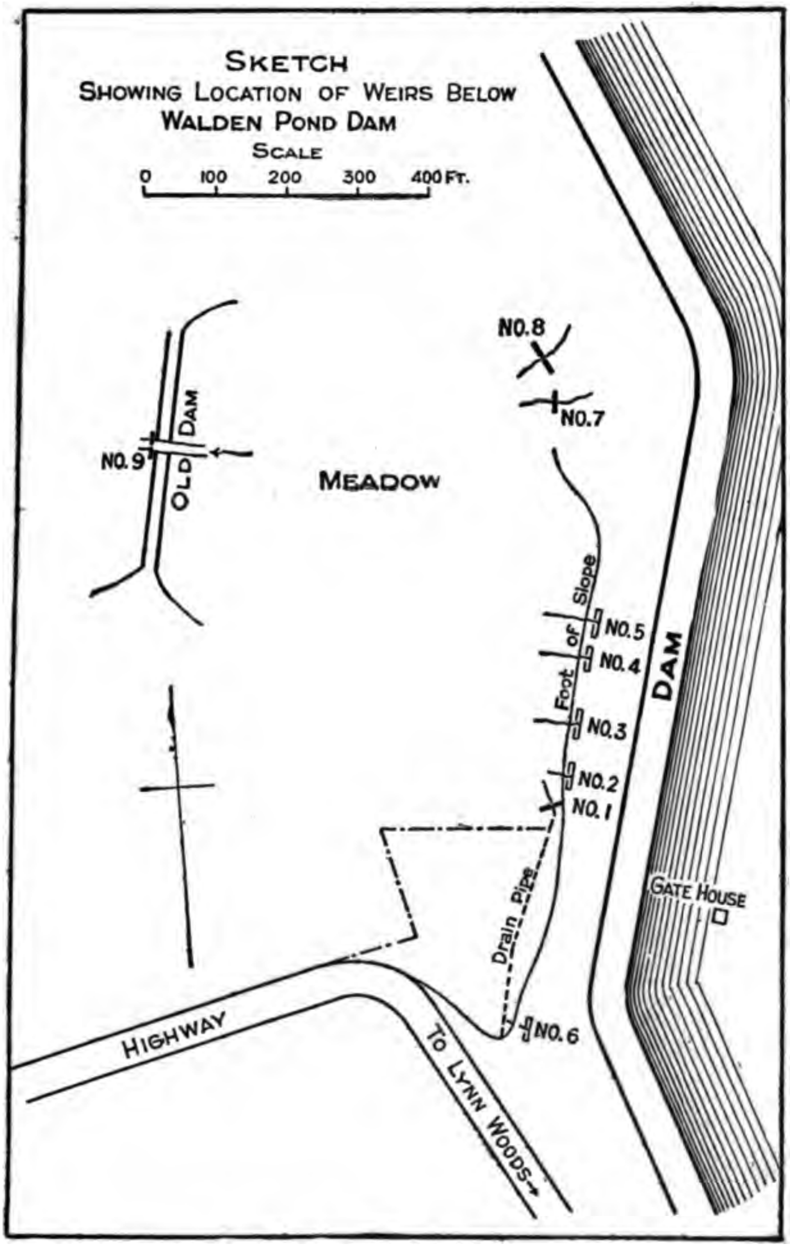
SHOWING LOCATION, SIZE AND KIND OF HYDRANTS SET IN 1909.

Alley, corner Blossom	6 Walker
Atkinson	6 Walker
Autumn, between 50 and 54	6 Walker
Bay State road, corner Greenwood road	6 Walker
Blake, front of 6	6 Walker
Broad, front of 44	6 Walker
Broad, between 64 and 68	6 Walker
Broad, corner Atlantic	*6 Walker
Broad, corner Nahant	*6 Walker
Broad, corner Newhall	*6 Walker
Broad, corner Portland	*6 Walker
Boston, opposite Washington	*6 Walker
Chatham, corner Chatham court	*6 Walker
Church, corner South Common	*6 Walker
Collins, opposite Wayne avenue	*6 Walker
Commercial, corner Sea Street Extension	*6 Walker
Deer cove, corner Lynn Shore Drive	*6 Walker
Essex, opposite Mansur place	*6 Walker
Fair Oaks avenue, opposite No. 33	6 Walker
Fortesque terrace, end of pipe	6 Boston
Graves avenue, between 33 and 35	6 Walker
Graves avenue, corner Goodridge	6 Walker
Green, corner Howard	†6 Walker
High Rock, corner Valley avenue	6 Walker
High Rock, between 41 and 43	†6 Carr
Kirtland, between 69 and 73	6 Walker
Lewis, corner Breed	*6 Walker
Lincoln, front of 20	*6 Walker
Lincoln, front of 36	†6 Walker
Lynnfield, front of 23	6 Walker
Lynnfield, opposite 3d Cemetery gate	*6 Walker
Linwood, corner Cliff	6 Walker
Michigan avenue, between 21 and 25	*6 Walker
Mulberry, front of 36	*6 Walker
Nelson, corner Hood	4 Boston
Neptune, corner Vine	6 Walker
Newhall, front of 29	†6 Walker
Newhall, front of 51	†6 Carr

Oakville, opposite West Neptune	*6 Walker
Oakville, front of 25	6 Walker
Ocean, front of 48	*†6 Walker
Ocean terrace, corner Lynn Shore Drive	*6 Walker
Oneida, between 9 and 11	6 Walker
Orchard, corner Bennett	†6 Holyoke
Oxford	8 Walker
River	*6 Walker
Rockaway, front of 78	*6 Walker
Salem, between 9 and 13	6 Walker
Sanderson avenue, corner Chatham	†6 Boston
Sea Street Extension, corner Board of Health road	6 Walker
Sewell, opposite Coburn	6 Walker
Silsbee, opposite Friend	*6 Walker
Sluice road, corner Kenwood road	6 Walker
Smith, between 20 and 22	6 Walker
Smith, front of 54	†6 Holyoke
South Common, corner Pleasant	6 Walker
Stone place, end of pipe	6 Walker
Sweetser terrace, end of pipe	6 Holyoke
Trevett avenue, end of pipe	6 Boston
Union, front of 330	*8 Walker
Union, front of 420	*†6 Walker
Walnut, corner Cedar	*6 Walker
Walnut, front of Pumping Station	*†6 Walnut
Walnut, front of Tracy school	*6 Walker
Walnut, between 62 and 66	*†6 Walker
Washington, opposite Amity	*6 Walker
Washington, front of 703	*6 Walker
Washington, corner Western avenue	*6 Walker
Washington, front of 159	6 Walker
Washington, front of 183	6 Walker
Washington, front of 227	6 Walker
Western avenue, corner Cleveland	6 Walker
Western avenue, corner Tucker	6 Walker
Western avenue, between 295 and 303	6 Walker
Western avenue, between 321 and 325	6 Walker
Western avenue, front of 267	6 Walker
West Neptune, corner Elmwood avenue	*6 Walker
West Neptune, between 143 and 145	6 Walker

*Renewed.

†Moved.



SKETCH
SHOWING LOCATION OF WEIRS BELOW
WALDEN POND DAM

Flow of Water Over Weirs, Foot of Walden Pond Dam

(Gallons per 24 Hours.)

Date 1910	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
January 3	20-9	....	1,758	....	1,780	1,802	....	13,307	7,895	....
January 10	21-4	....	2,793	....	1,780	2,863	....	10,048	7,895	....
January 17	21-8	....	1,758	....	1,780	1,802	....	13,307	10,455	....
January 24	20-9	....	1,758	954	1,780	1,802	....	13,307	22,405	....
January 31	19-5	....	1,758	954	1,780	1,802	....	13,307	19,204	....
February 7	18-11	....	931	....	1,780	1,802	....	10,048	13,229	267,192
February 14	21-9	....	....	....	....	....	....	10,048	....	304,731
February 21	24-4	....	....	....	2,828	2,863	....	20,368	....	759,620
February 28	26-10	....	3,827	2,863	1,780	1,802	....	28,515	45,450	918,611
March 7	29-11	...	1,758	1,802	1,780	3,923	640	24,442	41,182	706,624
March 14	31-8	....	1,758	954	1,780	1,802	1,920	24,442	25,819	426,182
March 21	33-6	112,174	1,758	1,802	2,828	2,863	1,920	28,515	25,819	560,882
March 28	35-1	124,423	2,793	2,863	2,828	2,863	3,627	28,515	29,446	609,463
April 4	36-8	124,423	2,793	2,863	2,828	2,863	3,627	32,861	29,446	609,463
April 11	38	150,209	2,793	2,863	2,828	5,196	3,627	32,861	33,278	658,043
April 18	38	177,931	5,009	3,923	3,875	6,574	5,761	37,477	45,450	759,620
April 25	38	163,748	3,827	2,863	3,875	6,574	3,627	32,861	33,278	706,624
May 2	38	177,931	3,827	2,863	3,875	7,954	3,627	32,861	37,128	759,620
May 9	38	192,114	3,827	2,863	3,875	6,574	3,627	32,861	37,128	759,620
May 16	37-11	192,114	3,827	2,863	3,875	6,574	3,627	32,861	29,446	706,624
May 23	37-11	177,931	3,827	2,863	3,875	7,954	3,627	28,515	....	706,624
May 30	37-10	177,931	3,827	2,863	2,828	6,574	3,627	28,515	....	758,043
June 6	37-10	252,713	3,827	3,923	5,132	9,544	3,627	47,254	....	1,653,941
June 13	38-1	206,290	3,827	3,923	3,875	7,954	3,627	32,861	....	973,816
June 20	38-4	206,296	3,827	3,923	3,875	6,574	3,627	28,515	....	759,620
June 27	37-9	221,769	3,827	3,923	3,875	6,574	3,627	28,515	....	759,620

Flow of Water Over Weirs, Foot of Walden Pond Dam—*Continued*

(Gallons per 24 Hours)

Date 1910	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
July 4	36-3	206,296	2,793	2,863	3,875	6,574	3,627	28,515	. . . .	706,624
July 11	34-5	192,114	2,793	2,863	2,828	5,196	1,920	24,442	. . . .	706,624
July 18	32-6	163,748	2,793	2,863	2,828	3,923	1,920	20,368	19,204	658,043
July 25	30-7	150,209	2,793	2,863	2,828	3,923	640	20,368	10,003	514,510
August 1	30-1	137,316	2,793	1,802	2,828	2,863	640	20,368	16,003	600,463
August 8	29	112,174	1,758	1,802	2,828	2,863	640	16,837	13,229	470,346
August 15	28	100,569	1,758	1,802	. . . .	2,863	640	16,837	10,455	384,226
August 22	27-1	88,965	931	954	. . . .	1,802	640	16,837	7,895	384,226
August 29	25-11	67,691	1,758	954	. . . .	1,802	640	13,307	7,895	420,182
September 5	25-3	58,021	1,758	1,802	. . . .	2,863	640	20,368	16,003	470,346
September 12 . . .	24-6	39,970	931	945	. . . .	954	. . .	13,307	5,761	304,731
September 19 . . .	23-10	31,589	931	954	. . . .	954	. . . .	10,048	5,761	207,192
September 26 . . .	23	31,589	931	318	. . . .	954	. . . .	10,048	5,761	231,861
October 3	22	23,853	931	318	. . . .	954	. . . .	7,332	3,627	231,861
October 10	21-1	23,853	931	318	942	318	. . . .	7,334	3,627	231,861
October 17	20-1	17,406	931	318	942	318	. . . .	4,616	3,627	198,738
October 24	19-2	17,406	931	318	942	318	. . . .	4,616	5,761	231,861
October 31	18-4	17,406	931	318	942	318	. . . .	2,444	1,920	165,615
November 7	17-7	17,406	931	318	942	318	. . . .	2,444	3,627	231,861
November 14	16-8	17,406	931	318	942	318	. . . .	2,444	1,920	165,615
November 21	15-11	10,959	931	318	314	318	. . . .	2,444	640	165,615
November 28	15-1	10,959	931	. . . .	314	318	. . . .	814	640	136,908
December 5	14-3	10,959	931	. . . .	314	318	. . . .	814	640	136,908
December 12	13-2	5,802	931	. . . .	314	. . . .	. . . .	. . . .	. . . .	108,201
December 19	12	5,802	931	. . . .	942	. . . .	. . . .	. . . .	. . . .	165,615
December 26	11-2	10,959	310	. . . .	314	942	. . . .	2,444	. . . .	195,738

CHIEF INSPECTOR'S REPORT.

LYNN, MASS., January 1, 1911.

Thomas Campbell, 2d, President:

SIR,—I have the honor to submit the following report of the Inspectors for the year 1910.

W. B. MOULTON.—Reading 14,228 meters, inspecting 4,051 houses, delivered 6,252 water bills, delivered 836 summons, thirteen days special for Superintendent and Registrar, four days assorting bills, ten days collecting, twelve days vacation.

JOHN CHAMBERLAIN.—Reading 10,850 meters, inspecting 5,868 houses, delivered 3,842 water bills, delivered 853 summons, three days special for Registrar, six days assorting water bills, two days collecting, sixteen days vacation.

F. E. SPRAGUE.—Reading 14,162 meters, inspecting 6,675 houses, delivered 4,875 water bills, delivered 740 summons, five days special for Registrar, three days collecting, twenty-one days sick and vacation.

H. L. NILES.—Reading 12,295 meters, inspecting 5,066 houses, delivered 3,417 water bills, delivered 679 summons, five days special for Registrar, thirty-one days collecting, eight days vacation.

J. E. DRISCOLL.—Reading 19,578 meters, inspecting 5,911 houses, delivered 7,978 water bills, delivered 712 summons, three days assorting water bills, seven days special for Registrar, three days collecting, twelve days vacation.

J. F. POOL.—Verifying 33,269 inspections with books, verifying 67,987 meter readings with books, making 35,623 inspection blanks, issued 502 leak notices, changed 1,016 meters, found 1,572 filters, thirty-four days assorting water bills and summons, six days vacation.

ADDITIONAL FIXTURES.—Five hundred and eight-two families, 1,027 faucets, 386 set tubs, 590 bath tubs, 700 water closets, 340 horses, 18 cows, 43 heaters.

Respectfully submitted,

(Signed) J. F. POOL,

Chief Inspector.

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1910.

In form recommended by the New England Water Works Association.

LYNN WATER WORKS, LYNN, ESSEX CO., MASS.

GENERAL STATISTICS.

Population by census of 1910, Lynn and Saugus,	98,420
Date of construction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and Saugus river
Mode of supply,	Pumping to reservoir and stand-pipe.

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E. D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a*. Kind, soft.
   - *b*. Brand of coal used, Georges Creek, New River and Logan.
   - *c*. Average price of coal per gross ton, delivered, $3.38.
   - *d*. Percentage of ash, 8.51.
   - *e*. Wood, price per cord.
3. Coal consumed for the year, in pounds, Loretz. 3,806,600

Loretz.

none.
none.

3,806,600

2,564,635,500

139.05

141.05

673 7

(8)

Loretz.
79,255,160

EXPENSES.

$8.14
$.005½

In form reco

Lynn

Population l

Date of con.

Owned by

Source of su

Mode of sup

1. Builde
2. Descri

3. Coal c

		Loretz.
4.	[Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,	none.
4*a*.	Amount of other fuel used,	none.
5.	Total equivalent coal consumed for the year=(3)+(4), in pounds,	3,806,600
6.	Total pumpage for the year, in gallons, with allowance for slip,	2,564,635,400
7.	Average static head against which pumps work, in feet,	139.05
8.	Average dynamic head against which pumps work, in feet,	141.05
9.	Number of gallons pumped per pound of equivalent coal (5),	673 7
10.	$\text{Duty}=\frac{\text{gallons pumped (6)} \times \text{8.34 (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5).}}$	Loretz. 79,255,160

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

11.	Per million gallons pumped,	\$8.14
12.	Per million gallons raised one foot (dynamic),	\$.005½

FINANCIAL STATISTICS.

RECEIPTS.		
From meter rates	$161,867 84	
From fixture rates	113,343 90	
	$275,211 74	
From other sources		14,723 49
From maintenance account 1909		5,837 15
From construction account 1909		2,744 05
		$298,516 43

EXPENSES.		
Maintenance	$156,341 41	
Interest	64,528 25	
Sinking funds	54,756 00	
Rebate to Saugus	7,670 47	
Bal. to maint'ce acc'nt '11	12,476 25	
Bal. to construction '11	2,744 05	
		$298,516 43

Net cost of works to date	$2,966,946 48
Bonded debt to date	1,648,500 00
Value of Sinking Funds	568,280 31
Average rate of interest, 3¾ per cent	

STATISTICS OF CONSUMPTION OF WATER.

1.	Estimated population at date,	98,420
2.	Estimated population on lines of pipe,	98,420
3.	Estimated population supplied,	98,420
4.	Total consumption for the year (gallons),	2.564,950,500
5.	Passed through meters (gallons),	960,000,000
6.	Percentage of consumption metered,	37½ per cent
7.	Average daily consumption in gallons,	7,027,261
8.	Gallons per day to each inhabitant,	71.38
9.	Gallons per day to each consumer,	71.38
10.	Gallons per day to each tap,	458.62
11.	Cost of supplying water, per million gallons, figured on total maintenance (item CC),	$63 00
12.	Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds,	$90.00

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

1.	Kind of pipe,	Cement-lined, and cast-iron.
2.	Sizes,	From 36 to 4 inch.
3.	Extended during year (feet),	1 080

4. Renewed during year (feet),	**22,384**
5. Total now in use (miles),	**144+**
6. Cost of repairs per mile,	**$60.00**
7. Number of leaks per mile,	**.075**
8. Length of pipes less than 4 inches diameter (miles),	**Courts only**
9. Number of hydrants added during year	**40**
10. Number of hydrants (public and private), now in use,	**1,157**
11. Number of stop gates added during year,	**37**
12. Number of stop gates now in use,	**1,302**
13. Number of stop gates smaller than 4-inch,	**94**
14. Number of blow-offs,	**75**
15. Range of pressure on mains (pounds),	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	18,795
19. Discontinued (feet),	895
20. Total now in use (miles),	120
21. Number of service taps added during year,	351
22. Number now in use,	15,227
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	425

26.	Number now in use,	6,252
27.	Percentage of services metered,	37½ per cent
28.	Percentage of receipts from metered water (B÷C),	60 per cent
29	Number of motors and elevators added,	1
30.	Number now in use,	5

40th

ANNUAL REPORT

OF THE

COMMISSIONER OF
WATER AND WATER WORKS

CITY OF LYNN, MASSACHUSETTS

For the Fiscal Year Ending December 31, 1911

ANNUAL REPORT

OF THE

COMMISSIONER OF WATER AND WATER WORKS

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1911

LYNN, MASS.
FRANK S. WHITTEN, PRINTER
1912

ANNUAL REPORT

OFFICERS FOR 1911.

THOMAS CAMPBELL, 2D,
Commissioner of Water and Water Works.

D. A. SUTHERLAND, *Superintendent.*
WALLACE O. MUDGE, *Water Registrar.*
CHARLES A. COWLES, *Pumping Engineer.*
GEORGE H. VENN, *Assistant Engineer.*
REYNOLD H. SUTHERLAND, *Chief Draftsman.*
JAMES F. POOL, *Chief Inspector.*
HORACE G. LITTLEFIELD, *Foreman of Mains.*
HENRY T. WHEELOCK, *Foreman of New Service.*
MICHAEL J. CASEY, *Foreman of Service and Main Repairs.*
WARREN H. McCLAIN, *Foreman of Meters.*
JOHN H. NEWHALL, *Forman of Water-shed.*
REUBEN J. MANSIR, *Foreman of Stable.*
JOSEPH N. DRISCOLL, *Storekeeper.*

Clerks.

R. GUY NORTHEY,
HELENE C. PINKHAM,
L. MYRTLE HILLER,
MARY MARKS.

Inspectors.

WILLIAM B. MOULTON,
JAMES E. DRISCOLL,
JOHN CHAMBERLAIN,
FREDERICK E. SPRAGUE,
HARRY L. NILES.

PORT OF PUBLIC WATER DEPARTMENT.

issioner of Water and Water Works now submits nnual report of the Water Department showing accomplished during the year of 1911, the first Commission form of Government.

Financial.

s income for the year has been $305,877.99 an .17 in comparis with the receipts of last

EXPENDITU S.

ipe	$57.095 77	
s	28,899 69	
t Street Pumping Station	20.510 52	
expenses	14.102 50	
and shop	11,670 17	
ers	11,400 19	
e of water-shed	6,256 69	
den Pond Pumping Station	6,019 56	
axes (Saugus)	468 54	
axes (Lynnfield)	47 63	
amages	404 25	
	$156.875 51	
Sinking funds } Transfers	54.756 00	
Interest } Transfers	66,815 00	
Transfers	9,000 00	
Rebate to Saugus	8,047 46	
Balance to account, 1911	24.456 64	
		$319.950 61

The Maintenance, Receipts and Expenditures for the Year.

RECEIPTS.

Meter rates	$178,234 52	
Fixture rates	110,615 55	
Miscellaneous	18,623 16	
Total	$307,473 23	
Balance from account 1910	12,476 25	
Overdraft	1 13	
		$319,950 61

Improvement and Increase of Water Supply.

Early in the year a conference was held with the State Board of Health relative to increasing and improving our water supply. In 1910 the Water Board in conjunction with the City Council decided to install a Chemical Mechanical Filter Plant for the purification of our water supply. This method of purification did not meet with my approval or that of the State Board of Health as they had investigated the records and conditions of cities where these filters had been installed and found that the death rate had gradually increased since the installation of chemical mechanical filters.

The State Board of Health suggested that a long storage of our water would be a very satisfactory method of purificaton. This could be accomplished by raising the dam at Breed's Pond about 30 feet which would increase our storage capacity about 1,500,000,000 gallons. The City Engineer was instructed to prepare plans for the building of a new dam at Breed's Pond. These were made and were submitted to the State Board of Health at a meeting held March 2, 1911, at the State House, Boston. These plans were favorably received by the Board but they requested that we have plans made with more detail showing the territory to be flooded and the manner in which the water would be handled. City Engineer Leland made additional plans complying with the State Board of Health's request and these were presented to the Board at the next meeting and met with their approval. The plans for the better handling of the water were to erect and equip a pumping station at Montrose for the purpose of taking water from the river whenever necessary and to do away with flooding the meadows as we have been obliged to in years past in order to have the water run into Hawkes Pond. To connect the Glen Lewis end of Walden Pond and Breed's Pond with a pipe line and conduit this would enable us to get a much longer storage of water in Walden Pond.

The work on the new dam at Breed's Pond is progressing very satisfactorily and when completed we will be able to fill Breed's Pond from Walden and will be ready to make plans for increasing our supply by taking water from Ipswich river. A pumping station at Montrose has been built and equipped with two centrifugal pumps of three and five million gallon capacity. This enables us to take water from the Saugus river when the water in the river is too low to run by gravity into Hawkes Pond or when the water in the pond is higher than that in the river.

There is in process of construction at Glen Lewis end of Walden Pond a pumping station and screen house to be used in connection with the 36-in. pipe line and conduit to Breed's Pond which is nearly completed. This will allow us to use water from Walden Pond through Breed's Pond next summer and will greatly improve our system of storage.

We have continued to replace the old cement pipe with cast-iron pipe generally of a larger size and renewing the connecting services whenever it was found necessary.

Pumping Engines and Station.

It is essential that in the near future new pumping machinery be installed at the Walnut Street Station to take care of the increased consumption. The pumps that are now in use are not adequate to take care of this increase, with a proper factor of safety.

A change was made early in the year in the force mains to the reservoirs and main supply pipes to the city which eliminates any danger of a break in any of the pipes cutting off the supply to the city. The 20-in. cement supply pipe from the reservoir was relaid with cast-iron.

Meters and Meter Rates.

Meters have been read monthly and notices have been sent to the consumers whenever the readings have shown an unusual consumption.

Repair Shop.

It is expected that with the completion of the new Municipal Stable that the department will have a suitable repair shop and storage for supplies which it has been in need of for several years. The growth of the city has increased the work of the department so much that the present quarters are inadequate and the work is done at a disadvantage and increased cost.

I wish to acknowledge the courtesy and help given me by the Members of the Municipal Council and also the employees of the department in carrying out the large amount of work accomplished this year.

THOMAS CAMPBELL, 2D,
Commissioner of Water and Water Works.

Treasurer's Statement.

Amount of debt, December 19, 1910	$1,648,500 00	
Thirty years serial loan	175,000 00	
	$1,823,500 00	
Bonds matured and paid 1911	10,000 00	
		$1,813,500 00

SINKING FUNDS.

Amount of funds December 19, 1911	$568,280 31	
Received from City Treasurer 1911	54,756 00	
Earnings of Funds 1911	22,202 30	
	$645,238 61	
Deduct bonds paid in 1911	10,000 00	
		635,238 61
Total net debt		$1,178,261 39

Water Maintenance.

RECEIPTS.

Balance from account 1910	$12,476 25	
From Water Registrar	306,832 10	
From credits	642 26	
		$319,950 61

EXPENDITURES.

For maintenance	$164,922 97	
For interest	66,815 00	
For sinking funds	54,756 00	
Transfers	9,000 00	
		295,493 97
Balance to account, 1912		$24,456 64

ROBERT E. RAMSDELL,
City Treasurer.

REPORT OF WATER REGISTRAR.

To Thomas Campbell, 2d, Commissioner:

I herewith present the financial condition of the department for the year ending December 31, 1911.

RECEIPTS.

Meter rates, account 1911	$140,771 01	
Meter rates, account 1910	37,276 69	
Meter rates, account 1909	147 05	
Meter rates, account 1908	27 77	
Meter rates, account 1906	12 00	
		$178,234 52
Fixture rates, account 1911	$106,313 47	
Fixture rates, account 1910	1,875 58	
Fixture rates, account 1909	5 00	
Fixture rates, account 1908	6 25	
		108,200 30
Miscellaneous, sale of meters, etc.		10,693 96
Additional or fractional rates		2,415 25
Fines		303 60
Extra pipe, account 1911		4,181 61
Extra pipe, account 1910		1,589 37
Extra pipe, account 1909		142 79
Extra pipe, account 1908		5 59
Extra pipe, account 1907		38 75
Extra pipe, account 1906		72 25
Total receipts as per cash book		$305,877 99
Deposit of 1910		1,595 24
Balance in hands of Treasurer's acct. 1910		12,476 25
Overdraft		1 13
Total amount as per Treasurer's statement		$319,950 61

MAINTENANCE.

	Pay rolls	Bills	Total
Mains and repairs	$24,348 06	$32,747 71	$57,095 77
Services and repairs	18,553 33	10,346 36	28,899 69
Walnut Street Station	8,080 58	12,424 94	20,505 52
Salaries and office expenses	12,175 52	1,926 98	14,102 50
Stable and shop	4,793 11	6,877 06	11,670 17
Meters and repairs	3,634 32	7,765 87	11,400 19
Patrol and care of brooks	6,023 31	233 38	6,256 69
Walden Pond Station	3,675 03	2,344 53	6,019 56
Damages		408 08	408 08
Saugus tax		469 71	469 71
Lynnfield tax		47 63	47 63
	$81,283 26	$75,592 25	$156,875 51
Rebate to Saugus 50% of receipts			8,047 46
			$164,922 97

EXPENSES.

Maintenance	$156,875 51	
Interest	66,815 00	
Sinking Funds	54,756 00	
Rebate to Saugus	8,047 46	
Transfers	9,000 00	
Balance to account, 1912	24,456 64	
		$319,950 61

COMPARATIVE STATEMENT.

Receipts for 1911	$305,877 99
Receipts for 1910	291,501 82
Increase	$14,376 17

Amount outstanding as per balance sheet:

Fixture rates, account 1906	$7,580 78	
Fixture rates, account 1907	235 58	
Fixture rates, account 1908	158 11	
Fixture rates, account 1909	76 50	
Fixture rates, account 1910	292 25	
Fixture rates, account 1911	2,859 65	
Meter rates, account 1906	2,175 29	
Meter rates, account 1907	1,002 50	
Meter rates, account 1908	1,615 56	
Meter rates, account 1909	718 67	
Meter rates, account 1910	1,329 01	
Meter rates, account 1911	3 046 05	
		$21,089 95
Construction, account 1906	$2,723 62	
Construction, account 1907	3 00	
Construction, account 1908	15 63	
Construction, account 1909	62 05	
Construction, account 1910	125 92	
Construction, account 1911	1,618 46	
		4,548 68
Miscellaneous		1,055 00
		$26,693 63

Conduit and Pipe Line to Breed's Pond

Appropriation, loan			$175,000 00
Labor	$21,225 08		
Pipe line	34,929 40		
Gate house	880 00		
Miscellaneous expense	345 08		
		$57,379 56	
Montrose station	$3,024 00		
Gates and miscellaneous expense	941 58		
		3,965 58	
Birch Pond Dam, payments on contract	$4,842 40		
Miscellaneons expense	102 50		
		4,944 90	
			66,290 04
Balance to account, 1912			$108,709 96

STATEMENT.

SHOWING COST OF WORKS TO DECEMBER 19, 1910.

Mains, hydrants and gates	$883,595 30
Walden and Glen Lewis ponds	564,658 42
New supply and land	340,182 87
Services and courts	337,885 20
Engines and boilers	140,327 29
Hawkes pond	161,036 53
Reservoirs and lands	131,581 49
Birch pond and land	93,471 84
Engine house, pump and conduit, Walden pond,	83,003 72
Pipe conduits and land	81,289 39
Engine house and land	57,562 39
Breed's pond and land	57,135 28
Hawkes pond canal	47,947 33
Force mains and land	41,546 13
Meters	37,531 42
Stand-pipe and pumping machinery	34,274 07
Highland service	12,431 17
Engineering	11,157 95
Tubular wells	9,470 02
Filteration (special)	6,488 90
Workshop and stable	2,056 97
Compressor	515 00
Increased Water Storage	66,290 04
	$3,201,438 72
Less amount received for pipe	$165,122 60
Total net cost	$3,036,316 12

STATEMENT.

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 15
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,807 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,573 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 77
From January 1, 1889, to January 1, 1890	141,865 53
From January 1, 1890, to January 1, 1891	154,788 27
From January 1, 1891, to January 1, 1892	171,744 85
From January 1, 1892, to January 1, 1893	188,979 88
From January 1, 1893, to January 1, 1894	177,803 56
From January 1, 1894, to January 1, 1895	176,655 50
From January 1, 1895, to January 1, 1896	185,572 88
From January 1, 1896, to January 1, 1897	190,531 33
From January 1, 1897, to January 1, 1898	183,711 97
From January 1, 1898, to January 1, 1899	186,658 35
From January 1, 1899, to January 1, 1900	193,699 01
From January 1, 1900, to January 1, 1901	199,003 54
From January 1, 1901, to January 1, 1902	203,078 45
From January 1, 1902, to January 1, 1903	215,692 03
From January 1, 1903, to January 1, 1904	224,440 44
From January 1, 1904, to January 1, 1905	233,706 83
From January 1, 1905, to January 1, 1906	240,475 73
From January 1, 1906, to January 1, 1907	259,255 50
From January 1, 1907, to December 19, 1907	290,111 18
From December 19, 1907 to December 19, 1908	274,877 88
From December 19, 1908 to December 19, 1909	282,102 57
From December 19, 1909 to December 19, 1910	291,501 82
From December 19, 1910 to December 31, 1911	305,878 00
	$6,382,444 91

FUNDED WATER LOAN.

When Payable.		Rate Per Cent.	Amount
November	1, 1913	4	20,000
November	1, 1914	3¾	31,000
March	15, 1915	4	50,000
December	1, 1914	4	20,000
December	1, 1915	3¾	6,000
April	1, 1916	3½	2,000
May	1, 1916	3½	24,500
September	1, 1916	4	10,000
October	1, 1916	4	9,000
February	1, 1917	3½	6,500
June	1, 1917	3½	3,500
July	1, 1917	4	7,500
August	1, 1917	4	5,000
October	1, 1917	4	2,000
November	1, 1917	4	6,500
April	1, 1918	4	15,000
June	1, 1918	4	10,000
July	1, 1918	4	50,000
April	1, 1919	4	100,000
July	1, 1919	4	110,000
January	1, 1920	4	35,000
April	1, 1920	4	150,000
April	1, 1921	4	50,000
October	1, 1921	4	25,000
January	1, 1922	4	50,000
July	1, 1922	4	25,000
April	1, 1923	4	40,000
July	1, 1925	4	165,000
July	1, 1926	4	50,000
September	1, 1927	4	25,000
July	1, 1928	4	25,000
October	1, 1928	4	10,000
July	1, 1929	4	25,000
January	1, 1930	4	25,000
October	1, 1930	4	25,000
July	1, 1931	3½	25,000
January	1, 1932	3½	75,000
April	1, 1932	3½	325,000
			$1,638,500
June	1, 1912-1941	4	175,000
			$1,813,500

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

REPORT OF SUPERINTENDENT.

To the Commissioner of Water and Water Works:

I herewith present the 40th Annual Report of the Superintendent for the year ending 1911. We have taken our supply of water during the year from Breeds, Birch, Hawkes and Walden Ponds and Saugus River. A detailed statement of the transaction of the Water Department is given in the tables, diagrams, etc. following:

Water pumped and consumed during the years 1910 and 1911.	Gallons.
Total pumped in 1910	2,564,635,500
Total pumped in 1911	2,451,028,275
Decrease in pumpage in 1911	113,607,225
Total consumption in 1910	2,564,950,501
Total consumption in 1911	2,449,199,091
Decrease in consumption in 1911	115,751,410

The average consumption of water per day in 1910 was 7,027,261 gal. The average consumption in 1911 was 6,984,107 gal., showing a decrease of 43,153 gal. per day. The saving was probably due to the request from Commissioner Campbell to the citizens of Lynn to refrain from any unnecessary waste of water which evidently received careful consideration from the people.

The rainfall at the City Hall in 1911 was 37.26 inches. This is 11.25 inches more than in 1910. The large rainfall in June, July and August which was the largest for the corresponding three months of any year since 1898, enabled us to pump water from Hawkes Pond into Walden Pond into the months of September and December. This was nearly four months earlier than in 1910. The records show that on December 31, 1910, the quantity of water in all the ponds was 832,000,000 gallons. On December 31, 1911, our supply was 1,142,000,000 gallons or 311,000,000 gallons more than we had in 1910. This increase was due to the heavy rainfall and the precaution taken by the consumers in guarding against unnecessary waste of water.

The past year has been an exceptionally busy one. The department has laid over five miles of main pipe in the streets and nearly a mile of 36 inch pipe connecting Walden Pond with the canal to Breed's Pond. This canal, about 3,800 feet long, has been dug and is in readiness to run water from Walden Pond to Breed's Pond. The new dam at Breed's Pond is in process of construction and when completed will increase our storage capacity about one billion seven hundred million gallons. Two new pumping stations have been built, one at Montrose and one at Glen Lewis end of Walden Pond. The station at Montrose has been equipped with one three million gallons and one five million gallons centrifugal pump. The one at Walden Pond will be completed early next year and be ready to fill Breed's Pond from Walden, when the new dam at Breed's Pond is completed. We have built the foundation and sub-structure of reinforced concrete for a screen house over the end of the 36-inch pipe in Walden Pond.

The draughting department has furnished plans for all pipe lines and have taken measurements of the location of all the pipe, fittings and services laid. Diagrams have been made of all service and pipe lines.

Much additional work has been done on construction work in connection with the new dam at Breed's Pond, the two new pumping stations and the designing and inspecting of the screen house at Walden Pond. The foundations for the pumps at both new stations have been designed and laid out.

The amount of work done by the new service, service repair and meter department is shown in the tables following:

SERVICES AND REPAIRS.

New services in Lynn	343
New services in Saugus	138
Services discontinued	25
Services renewed	290
Services changed from old main to new	572
Service leaks repaired	486
Services frozen	19
Services cleaned out, no force	2,162
Services changed	10
Services extended	41
Service boxes removed	4
Service boxes repaired and reset	93
Number of feet of lead-lined pipe used	28,700
Number of feet of galvanized pipe used	10,151
Lead connections renewed without corporations	57
New meters	517
Meters repaired	736
Meters changed	89
Meter boxes new	12
Meter boxes repaired	3
Meters taken off and tested	70
Meters frozen and repaired	20
Stop cocks used	38
Finding and raising main gate boxes	68
Finding and raising main gate boxes repaired and renewed	15
Fire hydrants new	29
Fire hydrants renewed	30
Fire hydrants repaired	42
Fire hydrants moved	5
Main gates new	32
Main gates renewed	25
Main gates repaired	21
Main pipe leaks	8
Car sprinklers repaired	15

The following microscopic examinations were made by the State Board of Health.

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.						
Number of Sample . .	50699	50916	51115	51362	51572	51830						
Plants.												
DIATOMACEÆ:												
Asterionella	63	10	16	25	318	10						
Cyclotella	16	1	6	17	110	0						
Epithemia . . .	0	0	0	0	0	1						
Melosira	0	0	0	0	0	14						
Meridion	0	0	0	1	0	1						
Navicula	0	0	0	0	0	25						
Stauroneis	0	0	0	0	0	2						
Synedra	10	6	7	131	44	18						
Tabellaria	0	0	4	25	226	11						
Gomphonema	0	0	0	1	0	2						
CYANOPHYCEÆ:												
Cœlosphærium	0	0	0	0	2	0						
ALGÆ:												
Arthrodesmus . . .	0	0	0	0	4	0						
Botryococcus . . .	0	0	0	0	4	0						
Raphidium	4	0	0	0	16	0						
Scenedesmus . .	0	0	0	0	8	0						
Animals.												
FUNGI:												
Crenothrix	0	0	0	0	0	3						
Zoöglœa	2	2	3	3	3	12						
INFUSORIA:												
Cryptomonas	1	0	0	1	8	0						
Dinobryon	49	36	0	226	218	17						
Mallomonas	8	6	1	0	0	0						
Peridinium	0	3	0	0	0	0						
Trachelomonas . . .	0	0	0	0	0	1						
Vorticella	0	0	0	1	0	0						
Glenodinium	0	2	0	0	0	0						
Raphidomonas . . .	0	0	0	2	0	0						
VERMES:												
Anurea	0	0	1	0	0	0						
CRUSTACEA:												
Cyclops	0	0	.02	0	.06	0						
Daphnia	0	0	0	.02	0	0						
Chydorus	0	0	0	0	.18	0						
Diaptomus	0	0	.02	0	0	0						
Total	153	72	38	433	961	117						

Microscopical Examintion of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Date of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.	July 25.	August 18.	September 22.	October 26.	December 2.	December 21.
Number of Sample	50698	50915	51114	51361	51571	51829	52047	52243	52493	52709	52978	53135
Plants.												
DIATOMACEÆ:												
Asterionella	178	0	8	5	20	35	0	14	191	425	604	197
Cyclotella	5	0	2	5	30	90	8	16	5	25	40	32
Epithemia	0	0	0	0	0	0	0	0	0	3	0	1
Navicula	0	0	0	0	0	1	0	2	0	0	0	0
Synedra	105	0	5	51	3	8	0	1	1	5	8	7
Tabellaria	0	0	0	7	12	13	8	42	0	4	4	6
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	0	0	3	2	0	0	0
Chroöcoccus	0	0	0	0	0	0	0	1	0	0	0	0
Clathrocystis	0	0	0	0	0	1	0	0	0	1	0	0
Cœlosphærium	0	0	0	0	0	2	3	11	18	8	0	0
ALGÆ:												
Arthrodesmus	0	0	0	0	0	2	0	1	0	0	0	0
Botryacoccus	0	0	0	0	0	0	1	0	0	0	0	0
Pediastrum	0	0	0	0	0	0	0	0	0	1	0	0
Protococcus	0	0	0	0	0	0	0	98	0	0	0	0
Raphidium	1	0	0	0	4	0	0	0	6	6	24	1
Scenedesmus	0	0	0	0	0	0	0	0	0	2	0	0
Staurastrum	0	0	0	0	0	0	0	1	0	0	0	0
Staurogenia	0	0	0	0	0	0	0	0	0	2	0	0
Volvox	0	0	0	0	0	0	0	0	1	0	0	0
Animals.												
FUNGI:												
Crenothrix	0	0	0	0	0	1	15	0	0	0	2	0
Zoöglœa	3	2	3	2	2	5	8	5	2	3	3	2
RHIZOPODA:												
Actinophrys	0	0	0	0	0	0	2	1	0	0	0	0
INFUSORIA:												
Cryptomonas	0	1	0	5	0	0	0	0	0	2	2	0
Dinobryon	0	389	132	1216	71	144	0	47	0	8	16	0
Euglena	0	0	0	1	0	0	0	0	0	0	0	0
Euglenacus	0	0	1	0	0	0	0	0	0	0	0	0
Mallomonas	1	1	1	0	2	0	1	0	0	3	4	0
Monas	0	0	2	0	0	0	0	1	0	0	0	0
Peridinium	2	2	1	0	0	0	0	0	0	0	0	0
Synura	1	1	0	8	0	0	0	0	0	0	0	0
Trachelomonas	0	0	1	0	0	1	0	0	1	0	2	0
Chlamydomonas	0	2	0	0	0	0	0	0	0	0	0	0
Glenodinium	2	1	0	0	0	0	0	0	0	0	0	0
Vorticella	0	0	0	2	0	0	0	0	0	0	0	0
Raphidomonas	0	0	0	0	6	0	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	.02	0	0	.02	0	0	0	0	0	0	0	0
Total	298	399	156	1302	150	312	46	244	227	499	709	245

The following microscopic examinations were made by the State Board of Health.

Microscopical Examination of Water from Breed's Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.						
Number of Sample	50699	50916	51115	51362	51572	51830						
Plants.												
DIATOMACEÆ:												
Asterionella	63	10	16	25	318	10						
Cyclotella	16	1	6	17	110	0						
Epithemia	0	0	0	0	0	1						
Melosira	0	0	0	0	0	14						
Meridion	0	0	0	1	0	1						
Navicula	0	0	0	0	0	25						
Stauroneis	0	0	0	0	0	2						
Synedra	10	6	7	131	44	18						
Tabellaria	0	0	4	25	226	11						
Gomphonema	0	0	0	1	0	2						
CYANOPHYCEÆ:												
Cœlosphærium	0	0	0	0	2	0						
ALGÆ:												
Arthrodesmus	0	0	0	0	4	0						
Botryococcus	0	0	0	0	4	0						
Raphidium	4	0	0	0	16	0						
Scenedesmus	0	0	0	0	8	0						
Animals.												
FUNGI:												
Crenothrix	0	0	0	0	0	3						
Zoöglœa	2	2	3	3	3	12						
INFUSORIA:												
Cryptomonas	1	0	0	1	8	0						
Dinobryon	49	36	0	226	218	17						
Mallomonas	8	6	1	0	0	0						
Peridinium	0	3	0	0	0	0						
Trachelomonas	0	0	0	0	0	1						
Vorticella	0	0	0	1	0	0						
Glenodinium	0	2	0	0	0	0						
Raphidomonas	0	0	0	2	0	0						
VERMES:												
Anurea	0	0	1	0	0	0						
CRUSTACEA:												
Cyclops	0	0	.02	0	.06	0						
Daphnia	0	0	0	.02	0	0						
Chydorus	0	0	0	0	.18	0						
Diaptomus	0	0	.02	0	0	0						
Total	153	72	38	433	961	117						

Microscopical Examintion of Water from Birch Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Date of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.	July 25.	August 18.	September 22.	October 26.	December 2.	December 21.
Number of Sample . .	50698	50915	51114	51361	51571	51829	52047	52243	52493	52709	52978	53135
Plants.												
DIATOMACEÆ:												
Asterionella	178	0	8	5	20	35	0	14	191	425	604	197
Cyclotella	5	0	2	5	30	90	8	16	5	25	40	32
Epithemia	0	0	0	0	0	0	0	0	0	3	0	1
Navicula	0	0	0	0	0	1	0	2	0	0	0	0
Synedra	105	0	5	51	3	8	0	1	1	5	8	7
Tabellaria	0	0	0	7	12	13	8	42	0	4	4	6
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	0	0	3	2	0	0	0
Chroöcoccus	0	0	0	0	0	0	0	1	0	0	0	0
Clathrocystis . . .	0	0	0	0	0	1	0	0	0	1	0	0
Cœlosphærium . . .	0	0	0	0	0	2	3	11	18	8	0	0
ALGÆ:												
Arthrodesmus . .	0	0	0	0	0	2	0	1	0	0	0	0
Botryacoccus . .	0	0	0	0	0	0	1	0	0	0	0	0
Pediastrum . . .	0	0	0	0	0	0	0	0	0	1	0	0
Protococcus	0	0	0	0	0	0	0	98	0	0	0	0
Raphidium	1	0	0	0	4	0	0	0	6	6	24	1
Scenedesmus . . .	0	0	0	0	0	0	0	0	0	2	0	0
Staurastrum . . .	0	0	0	0	0	0	0	1	0	0	0	0
Staurogenia . .	0	0	0	0	0	0	0	0	0	2	0	0
Volvox	0	0	0	0	0	0	0	0	1	0	0	0
Animals.												
FUNGI:												
Crenothrix	0	0	0	0	0	1	15	0	0	0	2	0
Zoöglœa	3	2	3	2	2	5	8	5	2	3	3	2
RHIZOPODA:												
Actinophrys	0	0	0	0	0	0	2	1	0	0	0	0
INFUSORIA:												
Cryptomonas . . .	0	1	0	5	0	0	0	0	0	2	2	0
Dinobryon	0	389	132	1216	71	144	0	47	0	8	16	0
Euglena	0	0	0	1	0	0	0	0	0	0	0	0
Euglenacus	0	0	1	0	0	0	0	0	0	0	0	0
Mallomonas . . .	1	1	1	0	2	0	1	0	0	3	4	0
Monas	0	0	2	0	0	0	0	1	0	0	0	0
Peridinium	2	2	1	0	0	0	0	0	0	0	0	0
Synura	1	1	0	8	0	0	0	0	0	0	0	0
Trachelomonas . .	0	0	1	0	0	1	0	0	1	0	2	0
Chlamydomonas . .	0	2	0	0	0	0	0	0	0	0	0	0
Glenodinium	2	1	0	0	0	0	0	0	0	0	0	0
Vorticella	0	0	0	2	0	0	0	0	0	0	0	0
Raphidomonas . . .	0	0	0	0	6	0	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	.02	0	0	.02	0	0	0	0	0	0	0	0
Total	298	309	156	1302	150	312	46	244	227	499	709	245

Microscopical Examination of Water from Hawkes Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.	July 25.	August 18.	September 22.	October 26.	December 2.	December 21.
Number of Sample . .	50700	50917	51116	51363	51573	51831	52019	52244	52494	52710	53979	53130
Plants.												
DIATOMACEÆ:												
Asterionella . . .	0	0	0	0	0	109	3	0	5	15	43	1131
Cyclotella	0	0	0	0	0	0	4	0	2	1	5	22
Meridion	0	0	0	3	0	0	0	0	1	0	0	0
Navicula	2	0	0	5	2	0	2	98	20	0	0	0
Epithemia	0	0	0	0	1	0	0	0	0	0	0	1
Synedra	0	0	0	9	41	0	244	62	24	8	3	9
Tabellaria	0	0	0	5	10	0	15	21	26	3	1	7
Gomphonema	0	0	0	0	1	0	0	0	4	1	0	0
Pleurosigma	0	0	0	0	0	0	0	0	4	0	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	5	0	0	0	1	0	0
Cœlosphærium . .	0	0	0	0	0	0	0	2	0	0	0	0
Clathrocystis . . .	0	0	0	0	0	0	4	7	0	0	0	0
ALGÆ:												
Botryococcus	0	0	0	0	0	0	39	0	0	0	0	0
Closterium	0	0	0	0	0	0	1	0	0	0	0	0
Pediastrum	0	0	0	0	0	0	0	1	0	0	0	0
Raphidium	0	0	0	0	1	0	10	0	0	0	0	0
		0	0	0		0	0	0	0	0	0	2
Animals.	0	0	0	[illegible]		0	0	0	0	0	0	0
FUNGI:	0	0	0	0		0	0	0	0	0	0	0
Crenothrix	0	0	0	3	2	0	0	0	5	79	3	0
Zoöglœa	2	2	5	2	5	3	10	4	12	3	2	1
INFUSORIA:									0			
Cryptomonas . . .	0	5	2	0	0	0	0	0	0	0	2	0
Dinobryon	14660	764	0	32	0	0	0	0	5	0	0	0
Euglena	0	1	0	0	0	0	0	0	0	0	0	0
Mallomonas	0	0	0	0	0	0	1	0	0	0	0	2
Synura	0	5	1	0	0	0	0	0	0	0	0	0
Trachelomonas . . .	0	0	0	0	0	0	0	2	1	1	0	0
Glenodinium	14	9	0	1	0	0	0	0	0	0	4	1
Raphidomonas . . .	0	0	0	0	0	1	0	0	0	0	0	0
Bursaria	0	0	0	0	0	0	0	0	0	1	0	0
Halteria	0	0	0	0	0	0	1	0	0	0	0	0
Total	14678	786	8	60	63	118	334	197	109	113	63	1176

Microscopical Examination of Water from Walden Pond, Lynn.

Number of Organisms per Cubic Centimeter.

Date of Examination. 1911.	January 19.	February 16.	March 22.	April 20.	May 17.	June 23.	July 25.	August 18.	September 22.	October 26.	December 2.	December 21.
Number of Sample	50701	50918	51117	51364	51574	51832	52049	52344	52495	52711	52980	53137
Plants.												
DIATOMACEÆ:												
Asterionella	50	0	0	4	74	16	0	18	0	100	143	436
Cyclotella	4	0	0	1	1	258	40	0	6	8	7	2
Epithemia	0	0	0	1	0	0	0	0	0	0	0	0
Melosira	0	0	0	0	16	8	0	0	12	24	0	0
Meridion	0	0	1	1	0	0	0	0	0	0	0	0
Navicula	0	0	0	2	0	0	0	0	0	1	0	0
Stephanodiscus	0	0	0	0	0	0	0	0	0	1	0	0
Synedra	12	0	0	4	45	5	0	5	1	4	1	12
Tabellaria	5	0	0	3	38	17	2	3	17	10	4	4
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	6	0	0	1	0	0	0
Cœlosphærium	0	0	0	0	0	3	10	0	27	13	0	0
Merismopedia	0	0	0	0	0	0	0	6	0	0	0	0
Oscillaria	0	0	0	0	0	0	0	1	0	0	0	0
ALGÆ:												
Arthrodesmus	0	0	0	0	0	0	0	2	1	0	0	0
Botryococcus	0	0	0	0	0	0	0	0	2	0	0	0
Cœlastrum	0	0	0	0	0	1	0	0	0	0	0	0
Pediastrum	0	0	0	0	0	1	0	0	0	0	0	0
Protococcus	0	0	0	0	0	0	4	0	0	0	0	0
Raphidium	0	0	0	0	0	1	0	12	14	48	9	2
Scenedesmus	0	0	0	0	4	0	0	2	0	0	4	0
Animals.												
FUNGI: Crenothrix	0	0	1	2	0	6	0	0	0	0	4	0
FUNGI: Zoöglœa	2	1	8	5	3	3	3	7	10	8	2	1
RHIZOPODA:												
Amœba	0	0	0	0	0	0	0	1	0	0	0	0
INFUSORIA:												
Cryptomonas	0	0	1	2	0	0	0	2	0	0	1	0
Dinobryon	1536	1308	76	106	303	0	0	0	3	0	0	0
Euglena	0	3	0	1	0	0	0	0	0	0	0	0
Peridinium	0	2	0	0	0	0	0	0	0	0	0	0
Synura	0	5	0	0	0	0	0	0	0	0	0	0
Tintinnus	0	0	0	1	0	0	0	0	0	0	0	0
Trachelomonas	0	0	0	0	0	0	1	0	7	1	1	0
Vorticella	0	0	1	1	0	0	0	0	0	0	0	0
Chlamydomonas	0	16	1	0	0	0	0	0	0	0	0	0
Glenodinium	0	7	0	2	0	0	0	0	0	0	0	2
Raphidomonas	0	0	0	1	0	0	0	1	0	0	0	0
VERMES:												0
Synchæta	0	1	0	0	0	0	0	0	0	0	0	0
CRUSTACEA:												
Cyclops	.02	0	0	0	.04	0	.04	.02	.06	0	0	02
Diaptomus	0	0	0	0	0		0	0	.02	0	0	0
Total	1609	1343	89	137	484	325	60	60	101	218	176	459

Microscopical Examination of Water from Quannapowitt Lake.

Number of Organisms per Cubic Centimeter.

Day of Examination. 1911.	January 19.	February 16.	March 22.	April 21.	May 17.	June 26.	July 25.	August 18.	September 22.	October 26.	December 2.	December 26.
Number of Sample	50703	50920	51119	51366	51576	51831	52051	52247	52497	52713	52982	53139
Plants.												
DIATOMACEÆ:												
Asterionella	8	0	0	8	4	29	0	2	0	0	0	0
Cyclotella	0	0	0	0	0	1	0	0	0	0	0	0
Meridion	0	0	1	0	0	0	0	0	0	0	0	0
Navicula	1	0	0	1	4	2	0	2	0	1	0	0
Synedra	16	2	73	488	33	3	0	3	0	0	4	9
Tabellaria	0	0	10	35	46	0	0	0	0	0	0	0
Gomphonema	0	0	0	0	0	0	0	1	0	0	0	0
CYANOPHYCEÆ:												
Anabæna	0	0	0	0	0	3	0	0	0	0	0	0
Chroöcoccus	0	0	0	0	0	0	0	3	0	0	0	0
Cœlosphærium	0	0	0	0	0	1	0	0	0	0	0	0
Oscillaria	0	0	0	0	0	0	0	4	2	0	0	0
ALGÆ:												
Closterium	0	0	0	0	1	0	0	0	0	0	0	0
Cœlastrum	0	0	0	0	0	1	0	0	0	0	0	0
Pediastrum	0	0	0	0	1	0	0	0	0	0	0	0
Protococcus	0	0	0	0	8	0	0	5	0	0	0	0
Raphidium	0	0	0	0	1	0	0	1	0	0	0	0
Animals.												
FUNGI:												
Crenothrix	0	0	0	0	0	0	0	0	0	29	0	0
Zoöglœa	1	1	10	3	5	6	5	3	2	2	1	1
RHIZOPODA:												
Actinophrys	0	0	0	0	3	0	0	0	0	0	0	0
INFUSORIA:												
Cryptomonas	0	4	2	2	0	0	0	0	0	0	3	2
Dinobryon	116	19	20	4	0	0	0	38	0	0	392	1768
Euglenacus	0	0	1	0	0	0	0	0	0	0	0	0
Mallomonas	0	3	0	0	0	0	0	0	0	0	0	0
Monas	0	0	0	0	0	0	0	1	0	0	0	0
Peridinium	0	1	0	2	0	0	0	0	0	2	0	2
Synura	0	2	1	1	0	0	0	0	0	0	0	2
Trachelmonas	0	0	0	0	0	0	0	0	1	0	1	0
Uroglena	1	0	0	0	0	0	0	0	0	0	0	0
Chlamydomonas	0	2	5	0	0	0	0	0	0	0	0	0
Glenodinium	2	0	12	0	0	0	0	0	0	0	1	8
VERMES:												
Polyarthra	3	0	0	0	0	0	0	0	1	0	1	0
Synchæta	0	0	0	0	0	0	0	0	0	3	0	0
CRUSTACEA:												
Bosmina	0	0	0	0	.04	0	0	0	0	0	0	0
Cyclops	.04	0	0	0	0	0	0	0	0	0	0	.02
Total	148	43	135	544	106	46	5	65	6	37	403	1792

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1911.

MONTH.	GALLONS. Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	244,001,092	7,871,003	543,175	. . .	78.55	501.88
February	247,741,882	8,847,924	1,807,753	. . .	88.30	564.17
March	230,526,754	7,436,347	746,234	. . .	74.21	474.16
April	204,952,104	6,831,736	195,290	. . .	68.18	435.61
May	216,676,305	6,989,560	642,021	. . .	69.75	445.67
June	108,515,349	6,017,178	. . .	705,962	60.05	383.67
July	227,064,197	7,324,651	. . .	389,775	73.10	467.04
August	194,850,141	6,285,489	. . .	1,114,012	62.72	400.78
September	180,321,649	6,010,721	. .	1,167,878	59.98	383.27
October	175,531,638	5,662,311	. . .	1,389,540	56.51	361.05
November . . .	170,338,651	5,677,955	. . .	1,134,656	56.66	362.04
December	176,679,329	5,699,333	. . .	1,682,345	56.88	363.41
Totals and averages . .	2,449,199,091	6,710,134	. . .	317,127	67.07	428.56

Basis—Population Lynn and Saugus, estimated from census of 1910, 100,109.

TABLE II.

SHOWING THE RAINFALL AT THE CITY HALL FOR 1911.

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.27	.14	. .	. .	. .	. .	. .	. .	. .	.53	.02	. .
2	.06	s.10	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
3	.84	s.35	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
4	. .	.79	. .	1.18	. .	. .	. .	. .	. .	.11	. .	. .
5	. .	. .	s.01	.41	. .	. .	. .	. .	. .	. .	. .	. .
6	s.01	s.03	s.13	. .	. .	. .	1.45	. .	.22	.46	.33	. .
7	. .	s.17	. .	. .	. .	1.46	. .	. .	. .	. .	. .	. .
8	.12	s.10	. .	s.28	.03	. .	. .	. .	. .	. .	. .	. .
9	. .	. .	. .	s.15	. .	. .	. .	. .	.48	. .	. .	.04
10	. .	. .	.10	. .	. .	.03	. .	. .	. .	. .	.09	. .
11	.14	. .	. .	. .	. .	07	. .	. .	.02	. .	. .	. .
12	. .	. .	.15	. .	. .	.38	. .	. .	. .	. .	.35	. .
13	.06	s.09	. .	. .	. .	1.87	. .	. .	. .	. .	. .	. .
14	04	. .	68	.10	. .	. .	. .	. .	. .	. .	.82	.26
15	. .	. .	s.05	. .	. .	. .	. .	.80	.82	.14	. .	.30
16	. .	. .	. .	. .	. .	.19	. .	. .	. .	. .	. .	.40
17	. .	.15	. .	. .	. .	. .	. .	. .	. .	. .	.56	. .
18	. .	. .	.10	. .	.41	. .	. .	.36	. .	.37	.31	. .
19	. .	. .	.01	.06	. .	. .	. .	. .	. .	. .	. .	. .
20	. .	s.12	. .	.01	. .	. .	. .	. .	. .	. .	. .	. .
21	. .	. .	. .	. .	. .	. .	. .	. .	.15	.61	. .	. .
22	. .	. .	. .	.01	. .	. .	. .	. .	. .	.02	. .	1.73
23	. .	.	. .	. .	.08	. .	. .	. .	. .	. .	.	. .
24	. .	.	. .	. .	.01	. .	.65	.05	. .	. .	.81	. .
25	. .	. .	. .	. .	.01	. .	. .	.31	1.14	. .	. .	. .
26	.12	. .	.09	.	.01	.02	. .	40	. .	. .	. .	. .
27	.04	. .	.14	. .	. .	. .	.10	72	.04	. .	. .	. .
28	. .	. .	. .	. .	. .	. .	3.00	.50	. .	. .	.43	. .
29	.03	. .	.87	. .	. .	. .	. .	.51	.42	. .	. .	. .
30	. .	. .	. .	.11	. .	. .	. .	.31	. .	. .	. .	.08
31	. .	. .	. .	. .	.07	. .	. .	.87	. .	.23	. .	.36
Total	2.33	2.31	2.03	2.31	.65	4.02	5.20	4.83	3.29	2.47	3.72	3.17

s Snow.
Total for the year 37.20 inches.

The above rain-fall was measured with a standard rain gauge. This gauge was formerly located on the roof of the City Hall and the results obtained were unsatisfactory due to roof structures, etc., and it was removed in 1906 to the roof of the stable on lot adjoining the City Hall grounds.

TABLE I.

CONSUMPTION OF WATER FOR THE YEAR ENDING DEC. 31, 1911.

MONTH.	GALLONS.					
	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant per day.	Average to each service per day.
January	244,001,092	7,871,003	543,175	. . .	78.55	501.88
February	247,741,882	8,847,924	1,807,753	. . .	88 30	564.17
March	230,526,754	7,436,347	746,234	. . .	74.21	474.16
April	204,952,104	6,831,736	195,290	. . .	68.18	435.61
May	216,676,305	6,989 560	642,021	. . .	69.75	445.67
June	108,515,349	6,017,178	. . .	705.962	60.05	383.67
July	227,064,197	7,324,651	. . .	389.775	73.10	467.04
August	194,850,141	6,285,489	. . .	1,114,042	62.72	400.78
September	180,321,649	6,010,721	. . .	1,167.878	59.98	383.27
October	175,531,638	5,662,311	. . .	1,389,540	56 51	361.05
November	170,338,651	5,677,055	. . .	1,134,656	56.66	362.04
December	176,679,329	5,699,333	. . .	1,682,345	56.88	363.41
Totals and averages	2,449,199,071	6,710,134	. . .	317,127	67 07	428 56

Basis—Population Lynn and Saugus, estimated from census of 1910, 100,199.

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TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1911

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 . .	.25	s.13	. .	. .	. .	. .	. .	. .	. .	.23	.04	. .
2 . .	.04	s.45	. .	. .	. .	. .	. .	. .	. .	.03	s.03	. .
3 . .	.82	s.25	s.01	. .	. .	. .	. .	. .	. .	. .	. .	. .
4 . .	. .	.71	. .	s.68	. .	. .	.04	. .	. .	.04	. .	. .
5 . .	. .	. .	s.02	.37	. .	.02	. .	. .	. .	. .	. .	. .
6 . .	s.02	s.08	s.10	. .	. .	.93	1.55	. .	.14	.42	.24	. .
7 . .	. .	s.71	. .	. .	. .	. .	. .	. .	. .	.03	. .	. .
8 . .	.10	. .	. .	s.32	.04	. .	. .	. .	.03	. .	. .	. .
9 . .	. .	. .	. .	s.10	. .	. .	. .	. .	.40	. .	. .	.05
10 . .	. .	. .	.15	. .	. .	. .	. .	. .	. .	. .	.08	. .
11 . .	.16	. .	. .	. .	. .	.05	. .	.02	.02	. .	. .	. .
12 . .	. .	. .	.14	. .	. .	.32	. .	. .	. .	. .	.30	. .
13 . .	.08	s.14	. .	. .	. .	1.23	. .	. .	. .	. .	. .	. .
14 . .	.05	s.08	.66	.09	. .	. .	. .	. .	. .	. .	.70	s.30
15 . .	s.02	. .	s.08	. .	. .	. .	. .	.85	.60	.11	. .	.23
16 . .	. .	. .	. .	. .	. .	.20	. .	.02	. .	. .	. .	.26
17 . .	. .	.16	. .	. .	. .	. .	. .	. .	. .	.02	.46	.02
18 . .	. .	. .	.12	. .	.26	. .	. .	.39	. .	.20	.33	. .
19 . .	. .	. .	.39	.05	. .	. .	. .	. .	. .	. .	. .	. .
20 . .	. .	s.27	. .	.07	. .	.03	. .	. .	. .	. .	. .	. .
21 . .	. .	s.02	. .	. .	. .	. .	. .	. .	.12	.48	. .	. .
22 . .	. .	. .	.02	s.03	. .	. .	. .	. .	. .	.05	. .	1.53
23 . .	. .	. .	. .	. .	.05	. .	. .	. .	. .	. .	.05	. .
24 . .	. .	. .	. .	. .	. .	. .	.60	.05	. .	. .	.73	. .
25 . .	s.01	. .	. .	. .	.01	.01	. .	.27	1.10	. .	. .	. .
26 . .	s.12	. .	.08	. .	. .	.03	. .	.32	.03	. .	. .	.15
27 . .	.60	. .	.10	. .	. .	. .	.20	.48	.05	.06	. .	. .
28 . .	. .	. .	. .	. .	. .	. .	2.62	.53	.20	. .	.30	. .
29 . .	.02	. .	.64	. .	. .	. .	. .	.10	. .	. .	. .	. .
30 . .	. .	. .	. .	.03	. .	. .	. .	.28	. .	. .	. .	s.12
31 . .	. .	. .	. .	. .	.07	. .	. .	.45	. .	.22	. .	.25
Total	2.29	3.00	2.51	1.74	.43	2.82	5.01	3.76	2.69	1.89	3.26	2.91

s Snow.

Total for the year, 32.31 inches.

The above rain-fall was measured by a standard gauge. This gauge is located in the rear of Pumping Station on vacant lot.

TABLE IV.

SHOWING THE AVERAGE DEPTH OF THE WATER IN PONDS FOR EACH WEEK DURING 1911.

WEEK ENDING	FEET.							
	Breed's Pond.		Birch Pond.		Walden Pond.		Hawkes Pond.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
January 7	17	6	18	0	11	8	20	4
January 14	17	6	17	6	14	11	12	11
January 21	17	3	16	0	16	5	11	1
January 28	17	6	14	1	16	7	16	3
February 4	18	3	14	3	15	7	18	6
February 11	19	4	16	1	14	0	20	7
February 18	20	6	17	11	11	10	21	7
February 25	20	5	20	0	8	9	20	9
March 4	20	7	21	1	10	10	14	3
March 11	20	1	22	4	12	3	10	0
March 18	18	7	22	2	13	5	15	9
March 25	17	3	22	5	15	2	21	5
April 1	16	1	22	3	18	3	21	3
April 8	16	8	21	5	21	6	20	0
April 15	16	6	21	2	24	4	20	8
April 22	15	1	21	3	26	10	19	2
April 29	13	5	21	2	29	2	15	7
May 6	12	4	20	7	31	1	10	6
May 13	11	5	19	6	31	9	11	3
May 20	10	4	18	6	31	8	13	8
May 27	9	0	17	6	31	8	15	1
June 3	6	9	10	7	31	7	15	11
June 10	5	8	15	5	31	7	16	11
June 17	6	4	13	10	31	9	18	11
June 24	6	11	12	2	31	9	20	8
July 1	7	0	10	7	31	7	21	1
July 8	6	7	11	5	30	7	21	0
July 15	5	8	14	0	28	9	21	0
July 22			17	2	26	6	20	10
July 29			18	0	25	6	20	11
August 5			17	2	25	7	21	4
August 12			17	0	24	9	21	3
August 19			17	5	23	10	21	3
August 26			18	6	22	10	21	2
September 2			18	7	22	0	21	4
September 9			20	7	20	11	21	4
September 16			19	11	21	6	15	3
September 23			18	4	23	6	8	4
September 30			16	9	23	7	9	4
October 7			15	5	23	9	10	8
October 14			13	9	23	10	13	4
October 21			11	11	23	11	15	1
October 28			12	10	23	4	17	6
November 4			15	2	21	8	19	7
November 11			17	0	20	4	20	10
November 18			18	6	19	1	21	6
November 25			20	1	18	1	22	3
December 2			20	11	17	6	23	0
December 9			19	11	17	7	23	6
December 16			19	9	17	2	23	4
December 23			19	1	19	4	18	9
December 30			17	10	22	2	14	3

TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1911

INCHES.

DAY OF MONTH.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.25	s.13	. .	. .	. .	. .	. .	. .	. .	.23	.04	. .
2	.04	s.45	. .	. .	. .	. .	. .	. .	. .	.03	s.03	. .
3	.82	s.25	s.01	. .	. .	. .	. .	. .	. .	. .	. .	. .
4	. .	.71	. .	s.68	. .	. .	.04	. .	. .	.04	. .	. .
5	. .	. .	s.02	.37	. .	.02	. .	. .	. .	. .	. .	. .
6	s.02	s.08	s.10	. .	. .	.93	1.55	. .	.14	.42	.24	. .
7	. .	s.71	. .	. .	. .	. .	. .	. .	. .	.03	. .	. .
8	.10	. .	. .	s.32	.04	. .	. .	. .	.03	. .	. .	. .
9	. .	. .	. .	s.10	. .	. .	. .	. .	.40	. .	. .	.05
10	. .	. .	.15	. .	. .	. .	. .	. .	. .	. .	.08	. .
11	.16	. .	. .	. .	. .	.05	. .	.02	.02	. .	. .	. .
12	. .	. .	.14	. .	. .	.32	. .	. .	. .	. .	.30	. .
13	.08	s.14	. .	. .	. .	1.23	. .	. .	. .	. .	. .	. .
14	.05	s.08	.66	.09	. .	. .	. .	. .	. .	. .	.70	s.30
15	s.02	. .	s.08	. .	. .	. .	. .	.85	.60	.11	. .	.23
16	. .	. .	. .	. .	. .	.20	. .	.02	. .	. .	. .	.26
17	. .	.16	. .	. .	. .	. .	. .	. .	. .	.02	.46	.02
18	. .	. .	.12	. .	.26	. .	. .	.39	. .	.20	.33	. .
19	. .	. .	.39	.05	. .	. .	. .	. .	. .	. .	. .	. .
20	. .	s.27	. .	.07	. .	.03	. .	. .	. .	. .	. .	. .
21	. .	s.02	. .	. .	. .	. .	. .	. .	.12	.48	. .	. .
22	. .	. .	.02	s.03	. .	. .	. .	. .	. .	.05	. .	1.53
23	. .	. .	. .	. .	.05	. .	. .	. .	. .	. .	.05	. .
24	. .	. .	. .	. .	. .	. .	.60	.05	. .	. .	.73	. .
25	s.01	. .	. .	. .	.01	.01	. .	.27	1.10	. .	. .	. .
26	s.12	. .	.08	. .	. .	.03	. .	.32	.03	. .	. .	.15
27	.60	. .	.10	. .	. .	. .	.20	.48	.05	.06	. .	. .
28	. .	. .	. .	. .	. .	. .	2.62	.53	.20	. .	.30	. .
29	.02	. .	.64	. .	. .	. .	. .	.10	. .	. .	. .	. .
30	. .	. .	. .	.03	. .	. .	. .	.28	. .	. .	. .	s.12
31	. .	. .	. .	. .	.07	. .	. .	.45	. .	.22	. .	.25
Total	2.29	3.00	2.51	1.74	.43	2.82	5.01	3.76	2.69	1.89	3.26	2.91

s Snow.

Total for the year, 32.31 inches.

The above rain-fall was measured by a standard gauge. This gauge is located in the rear of Pumping Station on vacant lot.

TABLE VI.

[illegible]

	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	—	[illegible]	—	[illegible]
[illegible]	—	—	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	—	[illegible]
[illegible]	—	—	[illegible]	[illegible]
[illegible]	—	[illegible]	—	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]
[illegible]		—	[illegible]	[illegible]
[illegible]		[illegible]	—	[illegible]
[illegible]			[illegible]	[illegible]
[illegible]	[illegible]			[illegible]
*[illegible]			[illegible]	[illegible]
*[illegible]		[illegible]	[illegible]	[illegible]
[illegible]		[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]

*[illegible]

TABLE VII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1911.

STREET.	FROM	TO	Taken out	Size Inches and Length Feet								Total
				4	6	8	10	12	16	20	36	
Alden‡	East Park avenue				309							309
Allen avenue			6		130							136
Allerton‡	Ford	Chestnut				1,040						1,040
Arbor†	End of pipe	Alden			213							213
Belleview‡	Lover's Leap avenue				147							147
Bernice†	End of pipe				190							190
Bessom*	Essex	Melvin avenue	6		1,067							1,067
Broadway	Bacheller	Cemetery	6			2,148						2,148
Cherry	Mudge	Essex	6		131							131
Clifton avenue	Jackson	Elmore	4		308							308
Clough*	Chestnut	Goldthwait	4		364							364
Coburn	Essex		4		1,020							1,020
Columbia avenue	Eastern avenue	Empire	6		800							800
Dana*	Williams avenue	Essex	4		245							245
Dennison avenue*	Maple	Gage	1½	333								333
East Park avenue‡	Harvest	Waitt road			1,039							1,039
Eastern avenue†	Essex	Huron					1,761					1,761
Echo Grove avenue†	End of pipe				204							204
Elmore*	Ingalls	Clifton avenue	4		275							275
Empire	Sewell		6		305							305
Eutaw avenue	Western avenue	Chatham	6						2,568			2,568
Great Woods road‡	Walden pond	Lynnfield									2,200	2,200
French*	Chestnut	Goldthwait	4		364							364
Gilbert†	End of pipe	East Park avenue			367							367
Glenwood road	End of pipe				700							700
Goss‡	Raddin Grove avenue			70								70
Grand View avenue†	End of pipe			125								125
Hamilton avenue	Lawton avenue	Bay View avenue	6			978						978
Holly avenue†	End of pipe			215		688						215
Jefferson	Chestnut		6									688
Kenwood drive‡	End of pipe	Crest avenue			733							735
Lily*	Adams	Sheridan	4		645							645

TABLE VII.

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1911.

STREET.	FROM	TO	Taken out	Size Inches and Length Feet								Total
				4	6	8	10	12	16	20	36	
Alden‡	East Park avenue		. .	. .	309	.	. .	. .	. .	. .	. .	309
Allen avenue			6	. .	130	. .	. .	. .	. .	. .	. .	136
Allerton‡	Ford	Chestnut	. .	. .	. .	1,040	. .	. .	. .	. .	. .	1,040
Arbor†	End of pipe	Alden	. .	. .	213	. .	. .	. .	. .	. .	. .	213
Belleview‡	Lover's Leap avenue		. .	. .	147	. .	. .	. .	. .	. .	. .	147
Bernice†	End of pipe		. .	. .	190	. .	. .	. .	. .	. .	. .	190
Bessom*	Essex	Melvin avenue	6	. .	1,067	. .	. .	. .	. .	. .	. .	1,067
Broadway	Bacheller	Cemetery	6	. .	. .	2,148	. .	. .	. .	. .	. .	2,148
Cherry	Mudge	Essex	6	. .	131	. .	. .	. .	. .	. .	. .	131
Clifton avenue	Jackson	Elmore	4	. .	308	. .	. .	. .	. .	. .	. .	308
Clough*	Chestnut	Goldthwait	4	. .	364	. .	. .	. .	. .	. .	. .	364
Coburn	Essex		4	. .	1,020	. .	. .	. .	. .	. .	. .	1 020
Columbia avenue	Eastern avenue	Empire	6	. .	800	. .	. .	. .	. .	. .	. .	800
Dana*	Williams avenue	Essex	4	. .	245	. .	. .	. .	. .	. .	. .	245
Dennison avenue*	Maple	Gage	1½	333	. .	. .	. .	. .	. .	. .	. .	333
East Park avenue‡	Harvest	Waitt road	. .	. .	1,039	. .	. .	. .	. .	. .	. .	1,039
Eastern avenue†	Essex	Huron	. .	. .	. .	. .	1,761	. .	. .	. .	. .	1,761
Echo Grove avenue†	End of pipe		. .	. .	204	. .	. .	. .	. .	. .	. .	204
Elmore*	Ingalls	Clifton avenue	4	. .	275	. .	. .	. .	. .	. .	. .	275
Empire	Sewell		6	. .	305	. .	. .	. .	. .	. .	. .	305
Eutaw avenue	Western avenue	Chatham	6	. .	. .	. .	. .	. .	2,568	. .	. .	2,568
Great Woods road‡	Walden pond	Lynnfield	. .	. .	. .	. .	. .	. .	. .	. .	2,200	2,200
French*	Chestnut	Goldthwait	4	. .	364	. .	. .	. .	. .	. .	. .	364
Gilbert†	End of pipe	East Park avenue	. .	. .	367	. .	. .	. .	. .	. .	. .	367
Glenwood road	End of pipe		. .	. .	700	. .	. .	. .	. .	. .	. .	700
Goss‡	Raddin Grove avenue		. .	70	. .	. .	. .	. .	. .	. .	. .	70
Grand View avenue†	End of pipe		. .	125	. .	. .	. .	. .	. .	. .	. .	125
Hamilton avenue	Lawton avenue	Bay View avenue	6	. .	. .	978	. .	. .	. .	. .	. .	978
Holly avenue†	End of pipe		. .	215	. .	688	. .	. .	. .	. .	. .	215
Jefferson	Chestnut		6	. .	. .	. .	. .	. .	. .	. .	. .	688
Kenwood drive‡	End of pipe	Crest avenue	. .	. .	733	. .	. .	. .	. .	. .	. .	735
Lily*	Adams	Sheridan	4	. .	645	. .	. .	. .	. .	. .	. .	645

TABLE VII.—*Continued.*

SHOWING SIZE AND TOTAL LENGTH OF CAST-IRON PIPE LAID IN 1911.

STREET	FROM	TO	Taken out	Size Inches and Length Feet								Total
				4	6	8	10	12	16	20	36	
Lexington†	End of pipe	President	. .	. .	150	. .	. .	. .	. .	. .	. .	150
Lynnfield‡	Great Woods road	Path to Pratt's Pines	. .	. .	. .	. .	. .	. .	. .	. .	1,471	1,471
Mansfield†	End of pipe		. .	200	. .	. .	. .	. .	. .	. .	. .	200
Mechanics court	Essex		1½	174	. .	. .	. .	. .	. .	. .	. .	174
Mudge	Cherry		4	. .	941	. .	. .	. .	. .	. .	. .	941
Munroe	Central avenue	Washington	8	. .	. .	. .	. .	178	. .	. .	. .	178
Myrtle‡	30-inch pipe	Walnut	. .	. .	. .	. .	. .	92	. .	. .	. .	92
Oakville*	Summer	Bennett	6	. .	. .	759	. .	. .	. .	. .	. .	759
Otis†	Wyoma	End of pipe	. .	. .	58	. .	. .	. .	. .	. .	. .	58
Path to Pratt's Pines‡	Lynnfield	End of canal	. .	. .	. .	. .	. .	. .	. .	. .	1,109	1,109
Prescott road*	Ocean	Lynn Shore drive	4	. .	589	. .	. .	. .	. .	. .	. .	589
President†	Lexington	Gertrude	. .	. .	338	. .	. .	. .	. .	. .	. .	338
Preston‡	Greenwood avenue	Stand pipe	. .	. .	. .	771	. .	. .	. .	. .	. .	771
RaddinGrove avenue†	End of pipe	Goss	. .	152	. .	. .	. .	. .	. .	. .	. .	152
Reservoir pipe line	Walnut	Preston	20	. .	. .	. .	. .	. .	. .	925	. .	925
Sheldon†	Coburn		. .	. .	132	. .	. .	. .	. .	. .	. .	432
Tracy avenue†	End of pipe		. .	. .	150	. .	. .	. .	. .	. .	. .	150
Virginia terrace‡	Broadway		. .	438	. .	. .	. .	. .	. .	. .	. .	138
Walnut‡			. .	. .	. .	. .	. .	40	. .	. .	. .	40
Western avenue	Eutaw avenue	President	6	. .	. .	. .	. .	. .	. .	. .	. .	1,565
Wyoma‡	Broadway	Otis	. .	. .	388	. .	1,565	. .	. .	. .	. .	388
*Whole street relaid †Pipe extended ‡New			Total	1,707	12,308	6,384	3,326	310	2,368	925	4,780	32,308

	MILES.	FEET.
Total length relaid	3	1,827
Total length extended	1	1,018
Total length new	1	3,163
Total length of system—Lynn, Saugus and Swampscott	149	1,487
Total length in Swampscott		1,788
Total length in Saugus	20	805

TABLE VIII.

SHOWING THE TOTAL LENGTH IN FEET AND SIZES OF SERVICES LAID IN LYNN AND SAUGUS IN 1911.

	8-in.	6-in.	4 in.	2-in.	1½-in.	1¼-in.	1-in.	¾-in.	Total.
Lynn . .	37	756	143	738	483	2,371	10,294	6,448	21,270
Saugus .	. .	. .	. .	. .	. .	196	3.966	2,140	6,302
Total . .	37	756	143	738	483	2,567	14,260	8,588	27,572

TABLE IX.

SHOWING THE LOCATION AND SIZE OF GATES SET IN 1911.

STREET.	LOCATION.
Alden	6-inch gate. 1 foot west of the east line of East Park avenue, 13 feet 2 inches south of the north side of Alden street.
Allen avenue	1½-in. valve. On the line of the west side of Apple street, 12 feet 2 inches south of the north side of Allen avenue.
Allerton	8-in. gate. On the line of the west side of Chestnut street, 19 feet 7 inches south of the north side of Allerton street.
Allerton	8-in gate. On the line of the east side of Ford street 16 feet south of the north side of Allerton street.
Arbor	6-in. gate. On the line of the south side of Alden street, 10 feet 6 inches north of the south side of Arbor street.
Belleview road	6-in gate. 9 feet 7 inches east of the west line of Lover's Leap avenue, 15 feet 10 inches south of the north side of Belleview road.
Bessom	6-in. gate On the line of the south side of Melvin avenue, 15 feet 10 inches west of the east side of Bessom street.
Boston	10-in. gate. On the line of the west side of Flint street, 16 feet 11 inches south of the north side of Boston street.
Broadway	8-in gate. 1 foot east of the line of the west side of Euclid avenue, 14 feet 9 inches south of the north side of Broadway.
Brookline	6-in. gate. On the line of the west side of Eastern avenue, 18 feet south of the north side of Brookline street.

TABLE IX—*Continued.*

STREET.	LOCATION.
Clough	6-in. gate. On the line of the east side of Chestnut street, 15 feet 6 inches south of the north side of Clough street.
Clough	6-in. gate. On the line of the west side of Goldthwait street, 17 feet 1 inch south of the north side of Clough street.
Columbia avenue .	6-in. gate. 1 foot 10 inches east of the west line of Eastern avenue, 16 feet 5 inches south of the north side of Columbia avenue.
Columbia avenve .	6-in. gate. On the line of the east side of Empire street, 16 feet 6 inches south of the north side cf Columbia avenue.
Dana	6-in gate. On the line of the south side of Essex street, 14 feet 8 inches west of the east side of Dana street.
Dennison avenue .	4-in. gate On the line of the south side of Gage street, 10 feet 3 inches east of the west side of Dennison avenue.
Dungeon Rock av.	1½-in. valve. 5 feet 8 inches north of the north line of Stiles street, 34 feet 6 inches east of the west side of Stiles street.
East Park avenue .	6-in. gate. On the line of the north side of Harvest street, 16 feet 6 inches west of the east side of East Park avenue.
Eastern avenue ...	10-in. gate. On the line of the south side of Essex street, 18 feet 11 inches west of the east side of Eastern avenue.
Eastern avenue ...	10-in gate. On the line of the north side of Brookline street, 17 feet 6 inches west of the east side of Eastern avenue.
Elmore...........	6-in. gate. On the line of the north side of Ingalls street, 9 feet 10 inches west of the east side of Elmore street.
Elmore	6-in. gate. On the line of the south side of Clifton avenue, 7 feet 6 inches west of the east side of Elmore street.

TABLE IX—*Continued.*

r.	LOCATION.
	6-in. gate. On the line of the east side of Dana street, 16 feet 6 inches north of the south side of Essex street.
r avenue	16-in. gate. On the line of front of platform of building at the junction of Eutaw avenue and Chatham street, 16 feet 8 inches west of the east east side of Eutaw avenue.
nch	6-in gate. 8 inches east of the east line of Chestnut street, 16 feet 4 inches south of the north side of French street.
ıch	6-in gate. On the line of the west side of Goldthwait street, 16 feet south of the north side of French street.
rt	6-in. gate. On the line of the west side of East Park avenue, 16 feet 2 inches south of the north side of Gilbert street.
oodridge	6-in. gate. On the line of the east side of Eutaw avenue, 15 feet 7 inches south of north side of Goodridge street.
Grace terrace	1½-in. valve. On the line of the west side of Nelson street, 4 feet north of the south side of Grace terrace.
Grey Circle	2-in. valve. On the line of the west side of Ocean street, 6 inches south of the north side of Grey Circle.
Greenwood avenue	2-in. valve. 1 foot south of the line of the north side of house No. 77, 16 feet 4 inches west of the line of the east side of house No. 18 Preston street.
Grover	6-in. gate. 1 foot 8 inches south of the south line of Hamilton avenue. 16 feet 10 inches west of the east side of Grover street.
Hamilton avenue	8-in. gate. On the line of the east side of Lawton avenue, 22 feet 2 inches south of the north side of Hamilton avenue.

TABLE IX—*Continued.*

STREET.	LOCATION.
Hamilton avenue .	8-in. gate. On the line of the east side of Grover street, 36 feet 10 inches north of the south side of Hamilton avenue.
Hamilton avenue .	8-in. gate. On the line of the west side of Bay View avenue, 16 feet 1 inch south of the north side of Hamilton avenue.
Jefferson	8-in. gate. 1 foot 2 inches west of the west line of Chestnut street, 21 feet 2 inches north of the south side of Jefferson street.
Jefferson	8-in. gate. 1 foot 11 inches west of the west line of Sheridan street, 17 feet 4 inches north of the south side of Jefferson street.
Kenwood Drive ...	1¼-in. valve. 22 feet west of the east line of Crest avenue 6 feet 4 inches south of the north side of Kenwood Drive.
Lily	6-in. gate. On the line of the south side of Adams street, 19 feet 4 inches west of the east side of Lily street.
Lily	6-in. gate. On the line of the west side of Sheridan street, 13 feet 4 inches north of the south side of Lily street.
Lexington.........	6-in. gate. 2 feet 9 inches east of the west line of President street, 16 feet 4 inches north of the south side of Lexington street.
Lynnfield	12-in. gate. Opposite the southern stone post to the first gate to St. Mary's Cemetery, 36 feet 3 inches east of the west side of Lynnfield street.
Mabel	2-in valve. On the line of the west side of President street, 13 feet 3 inches south of the north side of Mabel street.
Mechanics court ..	4-in. gate. On the line of the south side of Essex street, 11 feet 3 inches west of the east side of Mechanics court.
Michigan place ...	1¼-in. valve. On the line of the west side of Michigan avenue, 9 feet south of the north side of Michigan place.

TABLE IX—*Continued.*

STREET.	LOCATION.
Mudge	6-in. gate. On the line of the north side of Cherry street, 17 feet 4 inches west of the east side of Mudge street.
Munroe	12-in gate. On the line of the west side of Central avenue, 21 feet north of the south side of Munroe street.
Munroe	12-in. gate. On the line of the east side of Washington street, 19 feet 1 inch north of the south side of Munroe street.
Oakville............	8-in. gate. 1 foot 4 inches south of the north line of Bennett street, 32 feet 10 inches east of the west side of Oakville street.
Oakville.....	8-in. gate. On the line of the south side of West Neptune street, 32 feet east of the west side of Oakville street.
Oakville..........	8-inch gate. On the line of the south side of Summer street, 16 feet 9 inches west of the east side of Oakville street.
Ocean............	8-in. gate. On the line of the east side of Prescott road, 14 feet 7 inches north of the south side of Ocean street.
Prescott road	6-in. gate. 4 inches north of the south line of Ocean street, 12 feet 6 inches west of the east side of Prescott road.
Reservoir road	1½ valve. 12 feet 4 inches north of the line of the north side of house No. 13, 21 feet 2 inches east of the west side of Reservoir road.
Sheldon	6-in. gate. On the line of the east side of Coburn street, 17 feet 5 inches south of the north side of Sheldon street.
Summer..........	6-in. gate. 2 feet 6 inches east of the east line of Burns street, 15 feet 8 inches south of the north side of Summer street.
Superior	6-in. gate. On the line of the east side of Eastern avenue, 15 feet 6 inches south of the north side of Superior street.

TABLE IX—*Continued.*

STREET.	LOCATION.
Superior	6-in. gate. On the line of the west side of Eastern avenue, 16 feet 2 inches south of the north side of Superior street.
Virginia terrace...	4-in. gate. On the line of the east side of Broadway, 15 feet south of the north side of Virginia terrace.
Western avenue ..	10-in. gate 1 foot 3 inches west of the west line of Chatham street, 13 feet 4 inches south of the north side of Western avenue.
Western avenue...	10-in. gate. On the line of the east side of Chatham street, 14 feet 9 inches north of the south side of Western avenue.
Wyoma	6-in. gate. On the line of the north side of Broadway, 16 feet west of the east side of Wyoma street.

TABLE X.

SHOWING THE LOCATION, SIZE AND KIND OF HYDRANTS SET IN 1911.

Bernice, end of pipe	6	Boston
Boston, front of Sacred Heart Parish	*6	Mathews
Boston, corner Myrtle	*6	Mathews
Boston, 268 feet east of Ford street	6	Mathews
Boston, corner Childs	* 6	Walker
Chatham, front of 395	* 6	Mathews
Chatham, corner Lexington	*6	Mathews
Chatham, corner Western avenue	*6	Mathews
Clayton, corner Euclid avenue	*6	Mathews
Coburn, between 10 and 16	6	Mathews
Coburn, between 60 and 64	6	Mathews
Dearborn avenue, corner Reed	*6	Walker
Eastern avenue, opposite Williams avenue	6	Mathews
Eastern avenue, opposite Timson	6	Mathews
Eastern avenue, corner Superior	6	Walker
Echo Grove avenue, end of pipe	6	Boston
Essex, between 40 and 44	*6	Mathews
Essex, between 64 and 66	6	Mathews
Essex, opposite Porter	*6	Mathews
Essex, corner Empire	*6	Mathews
Essex, opposite Jackson	*6	Mathews
Essex, corner Chatham	*6	Mathews
Essex, opposite Alice avenue	6	Mathews
Essex, opposite Lawton avenue	*6	Mathews
Fayette, opposite Bloomfield	*6	Mathews
Glenwood road	6	Boston
Glenwood road, end of pipe	6	Holyoke
High Rock, corner Herbert	*6	Mathews
Hamilton avenue, between 76 and 82	*6	Mathews
Holyoke, opposite Gardiner	*6	Mathews
Jefferson, corner Sheridan	*6	Boston
Kenwood drive	6	Boston
Kenwood drive, corner Crest avenue	6	Holyoke
Lexington, corner President	6	Walker
Marion, corner Brookvale	6	Walker
Mechanics court, end of court	6	Boston
Oakville, corner Summer	*6	Mathews
Oakville, opposite Neptune	*6	Walker

Oakville, opposite 87	6 Mathews
Olive, corner Fayette	*6 Mathews
Park road, end of road	*6 Boston
Pearl, corner High	*6 Mathews
Pine Grove avenue, front of 25	*6 Walker
Prospect, front of 31	6 Mathews
Prescott place, front of 3	6 Mathews
Rockaway, opposite Rockaway court	*6 Walker
Sea street extension, opposite 100	6 Mathews
Sea street extension, opposite 118	6 Mathews
Sea street extension, 250 feet east of Commercial street	6 Mathews
Summer, front 593	*6 Mathews
Summer, front of 727	6 Walker
Summer, front of 627	*6 Mathews
Tremont, front of 58	6 Mathews
Tremont, front of 32	‡6 Mathews
Washington, between 265 and 269	6 Mathews
Washington, between 315 and 319	6 Mathews
Washington, front 1035	*6 Mathews
Western avenue, front of 599	*6 Walker
Wyoma, corner Otis	6 Mathews

*Renewed.
†Moved.

Flow of Water Over Weirs at Birch Pond Dam and at Saugus River Below the Dam.

(Gallons per 24 Hours.)

Date 1911	Depth in Birch Pond		Birch Pond Weir	Saugus River Weir
	Ft.	In.		
January 2	19	1	50,921	337,534
January 9	17	11	36,372	493,722
January 16	16	7	17,943	4.3,722
January 23	14	9	14,098	302,617
January 30	13	8	4,364	145,484
February 6	15	8	14,098	145,484
February 13	17	. .	30 067	203,684
February 20	19	10	30,067	302,617
February 27	20	. .	93,597	267,699
March 6	22	4	123,180	267,699
March 13	22	1	144,518	145,488
March 20	22	5	190,105	234,722
March 27	22	5	133,850	203,684
April 3	21	7	123.180	203,684
April 10	21	1	133,850	267,699
April 17	21	4	133,850	267,699
April 24	21	3	133,850	234,722
May 1	20	10	123,180	337,534
May 8	19	10	95,627	203,684
May 15	18	9	84,383	203,684
May 22	17	9	58,680	145,488
May 29	16	9	36,372	120,270
June 5	15	9	17,943	145,488
June 12	14	3	8,244	234,722
June 19	12	9	1,454	267,699
June 26	10	6	. . . .	267,699
July 3	10	9	. . . .	1,452,949
July 10	13	2	1,451	956,347
July 17	16	8	95,627	535,399
July 24	18	5	166,827	. . . . .
July 31	17	1	05,627	. . . . .
August 7	17	. .	75,645	. . . . .
August 14	17	3	75,645	. . . . .
August 21	17	11	84,383	. . . . .
August 28	18	3	93.597	. . . . .
September 4	19	9	133,850	. . . . .
September 11	20	5	133,850	. . . . .
September 18	18	10	95,627	. . . . .
September 25	17	2	50,921	. . . . .
October 2	15	9	30,067	. . . . .
October 9	14	6	. . . .	122,210
October 16	12	6	. . . .	122,210
October 23	12	2	. . . .	167,473
October 30	14	7	. . . .	167,473
November 6	16	8	. . . .	203,684
November 13	18	2	. . . .	337,534
November 20	19	9	. . . .	451,985
November 27	21	1	. . . .	760,422
December 4	20	2	. . . .	2,353,688
December 11	19	6	. . . .	2,720,372
December 18	19	5	. . . .	4.548,954
Deeember 25	18	4	. . . .	7,898,433

Flow of Water Over Weirs, Foot of Walden Pond Dam

(Gallons per 24 Hours.)

Date 1911	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
January 2	10	5,802	310	954	942	954	....	2,444	5,761	267,192
January 9	14-1	10,959	931	954	942	318	....	2,444	....	165,615
January 16	16-5	10,959	931	318	314	318	....	2,444	....	165,615
January 23	16-6	10,959	....	....	942	....	....	2,444	....	136,908
January 30	16-1	10,959	....	....	942	....	....	814	....	198,738
February 6	14-5	17,406	....	....	1,780	....	....	2,444	....	108,201
February 13	12-9	10,959	....	....	....	....	....	....	....	136,908
February 20	9-1	5,802	....	....	....	....	....	....	....	81,703
February 27	10-7	17,406	....	....	....	....	....	....	....	198,738
March 6	12-1	10,959	....	....	....	....	....	....	....	136,908
March 13	13-1	10,959	....	....	942	....	....	814	3,627	198,738
March 20	13-11	17,406	....	....	942	....	....	814	....	384,226
March 27	17-3	10,959	931	....	942	....	....	814	7,895	198,738
April 3	20-6	10,959	931	....	942	....	....	814	7,895	198,738
April 10	23-6	23,853	2,793	....	942	....	....	4,616	25,819	384,226
April 17	26-2	31,589	1,758	....	942	....	....	4,616	16,003	304,731
April 24	28-6	48,350	1,758	....	1,780	....	....	10,048	16,003	384,226
May 1	30-8	67,691	2,793	....	1,780	....	....	10,048	19,204	426,182
May 8	31-9	78,006	1,758	....	1,780	....	....	13,307	19,204	426,182
May 15	31-9	78,006	1,758	....	1,780	....	....	13,307	16,003	426,182
May 22	31-8	88,965	1,758	....	1,780	....	....	10,048	13,229	426,182
May 29	31-7	88,965	1,758	....	1,780	....	....	10,048	13,229	426,182
June 5	31-6	88,965	1,758	....	1,780	....	....	10,048	13,229	426,182
June 12	31-8	112,174	2,793	....	2,828	....	....	13,307	22,405	560,882
June 19	31-10	100,569	1,758	954	1,780	2,863	....	10,048	16,003	470,346
June 26	31-8	100,569	1,758	954	1,780	2,863	640	13,307	13,229	470,346

Flow of Water Over Weirs, Foot of Walden Pond Dam—*Continued*

(Gallons per 24 Hours)

Date 1911	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
July 3	31	88,965	1,758	954	1,780	2,863	640	13,307	10,455	426,182
July 10	29–5	88,965	1,758	954	1,780	1,802	640	10,048	7,895	384,226
July 17	27–1	67,691	1,758	954	1,780	1,802	640	10,048	5,761	304,731
July 24	25–6	48,350	1,758	954	942	954	640	7,332	1,920	267,192
July 31	25–10	58,021	1,758	318	942	954	640	10,048	5,761	344,479
August 7	25–1	48,350	931	318	942	954	640	7,332	3,627	304,731
August 14	24–1	31,589	931	318	942	954	. . . .	7,332	1,920	267,192
August 21	23–1	17,406	931	318	942	318	. . . .	4,616	1,920	267,192
August 28	22–3	23,853	931	318	1,780	1,802	. . . .	4,616	5,761	304,731
September 4	21–1	17,406	931	318	314	318	. . . .	4,616	640	231,861
September 11	21–3	23,853	1,758	318	942	954	. . . .	4,616	3,627	231,861
September 18	23–6	23,853	1,758	318	942	954	. . . .	4,616	3,627	231,861
September 25	23–6	23,853	931	318	942	954	. . . .	4,616	1,920	231,861
October 2	23–8	39,970	1,758	318	942	954	. . . .	10,048	16,003	514,510
October 9	23–10	23,853	931	318	942	954	. . . .	7,334	5,761	267,192
October 16	23–11	31,589	1,758	318	942	954	. . . .	7,332	5,761	304,731
October 23	23–7	31,589	931	318	942	954	. . . .	7,332	7,895	384,226
October 30	22	23,853	931	318	942	318	. . . .	4,616	3,627	231,861
November 6	20–8	17,406	931	318	942	318	. . . .	4,616	1,920	198,738
November 13	19–5	23,853	931	318	942	954	. . . .	4,616	3,627	267,192
November 20	18–4	17,406	931	318	942	318	. . . .	4,616	3,627	231,861
November 27	17–6	17,406	931	318	942	318	. . . .	2,444	3,627	198,738
December 4	17–6	17,406	931	318	942	954	. . . .	4,616	5,761	198,738
December 11	17–4	10,959	931	. . . .	942	318	. . . .	2,444	5,761	198,738
December 18	18–7	17,406	931	. . . .	942	954	. . . .	4,616	7,895	384,226
December 25	21–7	17,406	931	. . . .	942	954	. . . .	7,332	7,895	267,192

CHIEF INSPECTOR'S REPORT.

LYNN, MASS., January 1, 1912.

Thomas Campbell, 2d, Commissioner:

SIR.—I have the honor to submit the following report of the Inspectors for the year 1911.

W. B. MOULTON.—Reading 15,828 meters, inspecting 2,507 houses, delivered 6,084 water bills, delivered 793 summons, twenty-four days special for Superintendent and Registrar, three days assorting bills, twelve days collecting, nine days looking after hose playing out of hours, twelve days vacation.

JOHN CHAMBERLAIN.—Reading 13,144 meters, inspecting 4,793 houses, delivered 5,054 water bills, delivered 193 summons, six days special for Registrar, two days assorting bills, five days collecting, seven days looking after hose playing out of hours, nine days vacation.

F. E. SPRAGUE.—Reading 14,926 meters, inspecting 5,353 houses, delivered 5,642 water bills, delivered 406 summons, six days special for Registrar, five days collecting, six days looking after hose playing out of hours, ten days vacation.

H. L. NILES.—Reading 13,555 meters, inspecting 4,955 houses, delivered 4,649 water bills, delivered 411 summons, five days special for Registrar, five days collecting, six days looking after hose playing out of hours, twelve days vacation.

J. E. DRISCOLL.—Reading 18,163 meters, inspecting 4,612 houses, delivered 8,222 water bills, delivered 635 summons, four days assorting bills, twelve days special for Registrar, four days looking after hose playing out of hours, thirteen days vacation.

J. F. POOL.—Verifying 22,220 inspections with books, verifying 75,616 meter readings with books, making 26,750 inspection blanks, issued 1,581 leak notices, changed 1,052 meters, found 1,602 filters, twenty-one days assorting bills, six days vacation.

ADDITIONAL FIXTURES.—One thousand ninety-four families, 2,035 faucets, 1,113 set tubs, 1,099 bath tubs, 1,180 water closets, 77 heaters, 98 horses, 33 cows.

Respectfully submitted,

(Signed) J. F. POOL,
Chief Inspector.

Flow of Water Over Weirs at Birch Pond Dam and at Saugus River Below the Dam.

(Gallons per 24 Hours.)

Date 1911	Depth in Birch Pond		Birch Pond Weir	Saugus River Weir
	Ft.	In.		
January 2	19	1	50,921	337,534
January 9	17	11	36,372	493,742
January 16	16	7	17,943	413,722
January 23	14	9	14,098	302,617
January 30	13	8	4,364	145,484
February 6	15	8	14,098	145,484
February 13	17	. .	30 067	203,684
February 20	19	10	30,067	302,617
February 27	20	. .	93,597	267,699
March 6	22	4	123,180	267,699
March 13	22	1	144,518	145,488
March 20	22	5	190,105	234,722
March 27	22	5	133,850	103,684
April 3	21	7	123,180	203,684
April 10	21	1	133,850	267,699
April 17	21	4	133,850	267,699
April 24	21	3	133,850	234,722
May 1	20	10	123,180	337,534
May 8	19	10	95,627	203,684
May 15	18	9	84,383	203,684
May 22	17	9	58,680	145,488
May 29	16	9	36,372	120,270
June 5	15	9	17,943	145,488
June 12	14	3	8,244	234,722
June 19	12	9	1,454	267,699
June 26	10	6	. . . .	267,699
July 3	10	9	. . . .	1,452,949
July 10	13	2	1,451	956,347
July 17	16	8	95,627	535,399
July 24	18	5	166,827	. . . . .
July 31	17	1	95,627	. . . . .
August 7	17	. .	75,645	. . . . .
August 14	17	3	75,645	. . . . .
August 21	17	11	84,383	. . . . .
August 28	18	3	93,597	. . . . .
September 4	19	9	133,850	. . . . .
September 11	20	5	133,850	. . . . .
September 18	18	10	95,627	. . . . .
September 25	17	2	50,921	. . . . .
October 2	15	9	30,067	. . . . .
October 9	14	6	. . . .	122,210
October 16	12	6	. . . .	122,210
October 23	12	2	. . . .	167,473
October 30	14	7	. . . .	167,473
November 6	16	8	. . . .	203,684
November 13	18	2	. . . .	337,534
November 20	19	9	. . . .	451,985
November 27	21	1	. . . .	760,422
December 4	20	2	. . . .	2,353,688
December 11	19	6	. . . .	2,729,372
December 18	19	5	. . . .	4,548,954
December 25	18	4	. . . .	7,898,433

Flow of Water Over Weirs, Foot of Walden Pond Dam

(Gallons per 24 Hours.)

Date 1911	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
January 2	10	5,802	310	954	942	954	. . . .	2,444	5,761	267,192
January 9	14-1	10,959	931	954	942	318	. . . .	2,444	. . . .	165,615
January 16	16-5	10,959	931	318	314	318	. . . .	2,444	. . . .	165,615
January 23	16-6	10,959	. . . .	. . . .	942	. . . .	. . . .	2,444	. . . .	136,908
January 30	16-1	10,959	. . . .	. . . .	942	. . . .	. . . .	814	. . . .	198,738
February 6	14-5	17,406	. . . .	. . . .	1,780	. . . .	. . . .	2,444	. . . .	108,201
February 13	12-9	10,959	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	136,908
February 20	9-1	5,802	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	81,703
February 27	10-7	17,406	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	198,738
March 6	12-1	10,959	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	136,908
March 13	13-1	10,959	. . . .	. . . .	942	. . . .	. . . .	814	3,627	198,738
March 20	13-11	17,406	. . . .	. . . .	942	. . . .	. . . .	814	. . . .	384,226
March 27	17-3	10,959	931	. . . .	942	. . . .	. . . .	814	7,895	198,738
April 3	20-6	10,959	931	. . . .	942	. . . .	. . . .	814	7,895	198,738
April 10	23-6	23,853	2,793	. . . .	942	. . . .	. . . .	4,616	25,819	384,226
April 17	26-2	31,589	1,758	. . . .	942	. . . .	. . . .	4,616	16,003	304,731
April 24	28-6	48,350	1,758	. . . .	1,780	. . . .	. . . .	10,048	16,003	384,226
May 1	30-8	67,691	2,793	. . . .	1,780	. . . .	. . . .	10,048	19,204	426,182
May 8	31-9	78,006	1,758	. . . .	1,780	. . . .	. . . .	13,307	19,204	426,182
May 15	31-9	78,006	1,758	. . . .	1,780	. . . .	. . . .	13,307	16,003	426,182
May 22	31-8	88,965	1,758	. . . .	1,780	. . . .	. . . .	10,048	13,229	426,182
May 29	31-7	88,965	1,758	. . . .	1,780	. . . .	. . . .	10,048	13,229	426,182
June 5	31-6	88,965	1,758	. . . .	1,780	. . . .	. . . .	10,048	13,229	426,182
June 12	31-8	112,174	2,793	. . . .	2,828	. . . .	. . . .	13,307	22,405	560,882
June 19	31-10	100,569	1,758	954	1,780	2,863	. . . .	10,048	16,003	470,346
June 26	31-8	100,569	1,758	954	1,780	2,863	640	13,307	13,229	470,346

Flow of Water Over Weirs, Foot of Walden Pond Dam—*Continued*

(Gallons per 24 Hours)

Date 1911	Depth of Pond Ft. In.	No. 1 Weir	No. 2 Weir	No. 3 Weir	No. 4 Weir	No. 5 Weir	No. 6 Weir	No. 7 Weir	No. 8 Weir	No. 9 Weir
July 3	31	88,965	1,758	954	1,780	2,863	640	13,307	10,455	426,132
July 10	29-5	88,965	1,758	954	1,780	1,802	640	10,048	7,895	384,226
July 17	27-1	67,691	1,758	954	1,780	1,802	640	10,048	5,761	304,731
July 24	25-6	48,350	1,758	954	942	954	640	7,332	1,920	267,192
July 31	25-10	58,021	1,758	318	942	954	640	10,048	5,761	344,479
August 7	25-1	48,350	931	318	942	954	640	7,332	3,627	304,731
August 14	24-1	31,589	931	318	942	954	....	7,332	1,920	267,192
August 21	23-1	17,406	931	318	942	318	....	4,616	1,920	267,192
August 28	22-3	23,853	931	318	1,780	1,802	....	4,616	5,761	304,731
September 4	21-1	17,406	931	318	314	318	....	4,616	640	231,861
September 11	21-3	23,853	1,758	318	942	954	....	4,616	3,627	231,861
September 18	23-6	23,853	1,758	318	942	954	....	4,616	3,627	231,861
September 25	23-6	23,853	931	318	942	954	....	4,616	1,920	231,861
October 2	23-8	39,970	1,758	318	942	954	....	10,048	16,003	514,510
October 9	23-10	23,853	931	318	942	954	....	7,332	5,761	267,192
October 16	23-11	31,589	1,758	318	942	954	....	7,332	5,761	304,731
October 23	23-7	31,589	931	318	942	954	....	7,332	7,895	384,226
October 30	22	23,853	931	318	942	318	....	4,616	3,627	231,861
November 6	20-8	17,406	931	318	942	318	....	4,616	1,920	198,738
November 13	19-5	23,853	931	318	942	954	....	4,616	3,627	267,192
November 20	18-4	17,406	931	318	942	318	....	4,616	3,627	231,861
November 27	17-6	17,406	931	318	942	318	....	2,444	3,627	198,738
December 4	17-6	17,406	931	318	942	954	....	4,616	5,761	198,738
December 11	17-4	10,959	931	....	942	318	....	2,444	5,761	198,738
December 18	18-7	17,406	931	....	942	954	....	4,616	7,895	384,226
December 25	21-7	17,406	931	....	942	954	....	7,332	7,895	267,192

CHIEF INSPECTOR'S REPORT.

LYNN, MASS., January 1, 1912.

Thomas Campbell, 2d, Commissioner:

SIR.— I have the honor to submit the following report of the Inspectors for the year 1911.

W. B. MOULTON.—Reading 15,828 meters, inspecting 2,507 houses, delivered 6,052 water bills, delivered 793 summons, twenty-four days special for Superintendent and Registrar, three days assorting bills, twelve days collecting, nine days looking after hose playing out of hours, twelve days vacation.

JOHN CHAMBERLAIN.—Reading 13,144 meters, inspecting 4,703 houses, delivered 5,054 water bills, delivered 193 summons, six days special for Registrar, two days assorting bills, five days collecting, seven days looking after hose playing out of hours, nine days vacation.

F. E. SPRAGUE.—Reading 14,926 meters, inspecting 5,353 houses, delivered 5,642 water bills, delivered 406 summons, six days special for Registrar, five days collecting, six days looking after hose playing out of hours, ten days vacation.

H. L. NILES.—Reading 13,555 meters, inspecting 4,955 houses, delivered 4,649 water bills, delivered 411 summons, five days special for Registrar, five days collecting, six days looking after hose playing out of hours, twelve days vacation.

J. E. DRISCOLL.—Reading 18,163 meters, inspecting 4,612 houses, delivered 8,222 water bills, delivered 635 summons, four days assorting bills, twelve days special for Registrar, four days looking after hose playing out of hours, thirteen days vacation.

J. F. POOL.—Verifying 22,220 inspections with books, verifying 75,016 meter readings with books, making 26,750 inspection blanks, issued 1,581 leak notices, changed 1,052 meters, found 1,602 filters, twenty-one days assorting bills, six days vacation.

ADDITIONAL FIXTURES.—One thousand ninety-four families, 2,035 faucets, 1,113 set tubs, 1,099 bath tubs, 1,180 water closets, 77 heaters, 98 horses, 33 cows.

Respectfully submitted,

(Signed) J. F. POOL,

Chief Inspector.

SUMMARY OF STATISTICS.

For the Year Ending December 31, 1911.

In form recommended by the New England Water Works Association.

Lynn Water Works, Lynn, Essex Co., Mass.

GENERAL STATISTICS.

Population by census of 1910, Lynn and Saugus,	100,199
Date of contruction,	1871
Owned by	City of Lynn
Source of supply,	Artificial ponds and Saugus river
Mode of supply,	Pumping to reservoir and stand-pipe.

PUMPING STATISTICS.

1. Builders of Pumping Machinery, E D. Leavitt, and A. J. L. Loretz
2. Description of fuel used,
   - *a.* Kind, soft.
   - *b.* Brand of coal used, New River.
   - *c.* Average price of coal per gross ton, delivered, $4 75.
   - *d.* Percentage of ash, 8.21.
   - *e.* Wood, price per cord.
3. Coal consumed for the year, in pounds,

Loretz.	Leavitt.	Auxiliary.
3,125,700	462,600	109,200

uxiliary.

109,200

693,075

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Leavitt.

148,648

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3. C

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ASTOR, LENOX AND TILDEN FOUNDATIONS.

		Loretz.	Leavitt.	Auxiliary.
4.	[Pounds of wood consumed] ÷ 3 = equivalent amount of coal, pounds,			
4*a*.	Amount of other fuel used,			
5.	Total equivalent coal consumed for the year = (3) + (4), in pounds,	3,125,700	462,600	109,200
6.	Total pumpage for the year, in gallons, with allowance for slip,	272,969,500	349,365,700	28,693,075
7.	Average static head against which pumps work, in feet,	144.30	133.10	
8.	Average dynamic head against which pumps work, in feet,	144.81	133.60	262.7
9.	Number of gallons pumped per pound of equivalent coal (5),	663.2	755.2	262.7

10. $\text{Duty} = \frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5)}}$

Loretz.	Leavitt.
80,095,888	84,148,648

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES.

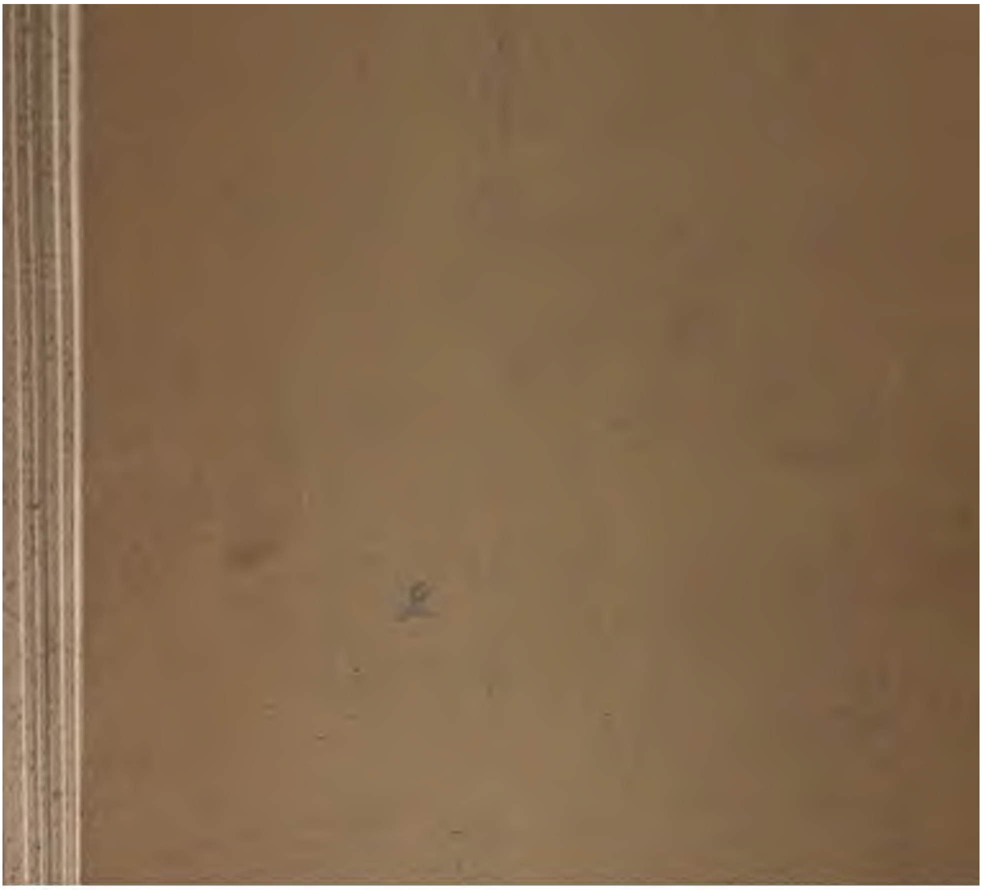
11.	Per million gallons pumped,	$8.14
12.	Per million gallons raised one foot (dynamic),	$ 005½

ed during year (feet),	17,667
ow in use (miles),	149+
repairs per mile,	$50.00
r of leaks per mile,	.055
gth of pipes less than 4 inches diameter (miles),	Courts only
Number of hydrants added during year	29
Number of hydrants (public and private), now in use,	1,186
Number of stop gates added during year,	32
Number of stop gates now in use,	1,334
Number of stop gates smaller than 4-inch,	172
Number of blow-offs,	75
5. Range of pressure on mains (pounds),	40 to 60

SERVICES.

16. Kind of pipe,	Cement-lined and lead-lined
17. Sizes (inches),	½ to 4
18. Extended (feet),	27,572
19. Discontinued (feet),	900
20. Total now in use (miles),	138
21. Number of service taps added during year,	343
22. Number now in use,	15,570
23. Average length of service (feet),	40
24. Average cost of service for the year,	$18.00
25. Number of meters added,	517

26.	Number now in use,	6,756
27.	Percentage of services metered,	43 per cent
28.	Percentage of receipts from metered water (B÷C),	60 per cent
29	Number of motors and elevators added,	1
30.	Number now in use,	5



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